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EXAMINATIONS
IN
ANATOMY AND PHYSIOLOGY;

BEING A COMPLETE
SERIES OF QUESTIONS AND ANSWERS;

DESIGNED AND INTENDED
AS PREPARATORY TO EXAMINATIONS AT THE DIFFERENT MEDICAL
SCHOOLS THROUGHOUT THE UNITED STATES;
AND FOR THOSE WHO ARE ABOUT TO PRESENT THEMSELVES
BEFORE THE ARMY AND NAVAL BOARDS:

TO WHICH ARE ANNEXED,
Tables of the Bones, Muscles, and Arteries.

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DEDICATION.

TO WILLIAM E. HORNER, M. D.,

PROFESSOR OF ANATOMY IN THE UNIVERSITY OF PENNSYLVANIA.

DEAR SIR :

To whom can I better dedicate this Volume than you, whose talents, industry, and untiring devotion to the science of Anatomy have raised you to the high and honourable situation you now fill? Your kind and affectionate deportment towards myself requires this at my hands.

That you may continue for many years to occupy and adorn the station to which you have been called; and that prosperity and happiness may ever attend you, is the sincere prayer of

Your devoted friend,

and most obedient servant,

THOMAS SYDENHAM BRYANT.

TO MEDICAL STUDENTS.

As a Preface is seldom read, and very often of no utility whatever, I shall not in the present work trouble you with one : I will only say, that it has been compiled from the best authors, and that I have bestowed much time and labour on it.

It is a work that has long been wanted by students, as the most intricate subjects are illustrated in the familiar style of question and answer. It is also an excellent book of reference for the practitioner. That it may meet your approbation, and be of essential service to you in the prosecution of your studies, is the sincere wish of

Your most obedient servant,

THOMAS SYDENHAM BRYANT.

ANATOMICAL EXAMINATIONS.

SECTION I.

OF ANATOMY IN GENERAL.

Ques. 1. What is Anatomy ?

Ans. Anatomy is that science which teaches the structure of the human body.

Ques. 2. What is morbid anatomy ?

Ans. Morbid anatomy explains the alterations in the structure of the body which are induced by disease.

Ques. 3. What is Physiology ?

Ans. Physiology is that science which teaches us the functions of the body, or the uses of its parts.

Ques. 4. What is the general division of the component parts of the human body ?

Ans. They are divided into solids and fluids.

Ques. 5. Enumerate the solids of the body.

Ans. The solids are the bones, cartilages, ligaments, muscles, cellular substance, membranes, vessels, nerves, glands, viscera, adipose substance, &c.

Ques. 6. What are bones ?

Ans. Bones are the most hard and inflexible parts of the body ; affording support and protection to all the rest.

Ques. 7. What are cartilages ?

Ans. Cartilages are the polished, elastic substances covering the ends of bones ; and, excepting these, harder than any other parts.

Ques. 8. What are ligaments ?

Ans. Ligaments, though fine and inelastic, are flexible bodies connecting bones.

Ques. 9. What are muscles ?

Ans. Muscles are bundles of red, soft, and contractile fibres ; the white, hard, and inelastic terminations of which are called tendons ; when in the form of cords, aponeuroses, or fascia, or when expanded as membranes.

Ques. 10. What is the cellular membrane ?

Ans. Cellular membrane is a tissue of interwoven membranes.

Ques. 11. What are membranes ?

Ans. Membranes are sheets of interwoven fibres.

Ques. 12. What are vessels ?

Ans. Vessels are long, cylindrical, and flexible tubes, dividing and subdividing into smaller branches. They are of three kinds ; 1st, arteries ; 2d, veins ; 3d, lymphatics.

Ques. 13. What are nerves ?

Ans. Nerves are bundles of small white cords, proceeding to or from the brain and spinal marrow.

Ques. 14. What are glands ?

Ans. Glands are distinct bodies formed by a peculiar arrangement of arteries, veins, lymphatics, and nerves, in a cellular parenchyma. There are two kinds of glands : —conglomerate and conglobate. The conglobate are for a peculiar secretion, as the salival glands. The conglomerate are appendages of the absorbent system.

Ques. 15. What are the viscera ?

Ans. The viscera are complicated organs, somewhat loosely contained in the cavities of the body ; such as the stomach, liver, &c.

Quest. 16. What is the adipose substance ?

Ans. The adipose substance consists of a cellular substance, within whose interstices an oleaginous fluid is deposited.

Ques. 17. Enumerate the fluids of the human body.

Ans. The fluids of the body are the blood, perspirable matter, urine, sebaceous matter, animal oil, ceruminous matter, saliva, tears, mucus, bile, gastric juice, semen, synovia, pancreatic juice, milk, chyle, &c.

Ques. 18. What is blood?

Ans. The blood is a fluid which circulates through the veins and arteries, which supplies the body with nutriment, and from which all its other fluids are secreted.

Ques. 19. What is the urine?

Ans. The urine is a fluid which is secreted by the kidneys.

Ques. 20. What is perspirable matter?

Ans. The perspirable matter is a fluid exhaled from the minute vessels of the skin.

Ques. 21. What is ceruminous matter?

Ans. The cerumen is a fluid secreted by the ceruminous glands of the meatus auditorius externus.

Ques. 22. What is sebaceous matter?

Ans. The sebaceous matter is a soapy fluid secreted by the sebaceous glands of the skin.

Ques. 22. What is animal oil?

Ans. Animal oil is the oleaginous fluid which occupies the cells of the adipose substance and the internal cavities of the bones, where it is called the medullary substance or marrow.

Ques. 23. What is saliva?

Ans. Saliva is a fluid secreted by the salival glands of the mouth.

Ques. 24. What are the tears?

Ans. The tears are a fluid secreted by the lachrymal gland in each orbit.

Ques. 25. What is the bile?

Ans. Bile is a fluid secreted by the liver.

Ques. 26. What is mucus ?

Ans. Mucus is a fluid secreted by the mucous glands of the mouth and nose, &c.

Ques. 27. What is the gastric juice ?

Ans. The gastric juice is a fluid secreted by the stomach.

Ques. 28. What is the semen ?

Ans. Semen is a fluid secreted by the testes, vesiculæ, seminales, and prostate gland.

Ques. 29. What is the synovia ?

Ans. Synovia is a fluid which lubricates the surfaces of joints

Ques. 30. What is the pancreatic juice ?

Ans. Pancreatic juice is a salival fluid secreted by the pancreas.

Ques. 31. By what is milk secreted ?

Ans. Milk is a fluid secreted by the glands of the female breasts.

Ques. 32. What is chyle ?

Ans. Chyle is a milky fluid obtained by digestion from our food, and passing into the blood vessels is there converted into blood.

Ques. 33. What divisions does the science of anatomy derive from the individual subjects which it considers.

Ans. Each kind of solid substance is considered apart; this occasions the division of anatomy into osteology, osteogeny, syndesmology, chondrology, myology, adenology, bursalogy, angiology, neurology.

Ques. 34. Give the explanation of these terms ?

Ans. Osteology treats of the form of perfect bones; osteogeny, of the ossific process or of the growth of bones; syndesmology, of the ligaments; chondrology, of the cartilages; myology, of the muscles, and their appendages—the tendons and aponeuroses; adenology, of the glands; splanchnology, of the viscera and organs of sense; bur-

salogy, of the bursæ mucosæ ; angiology, of the vessels ; and neurology, of the nerves.

SECTION II.

OF THE BONES IN GENERAL.

Ques. 1. What is the periosteum ?

Ans. The periosteum is a membrane which covers the bones every where, and from which they derive their nourishment.

Ques. 2. What is the perichondrium ?

Ans. The perichondrium is the name given to the periosteum where it passes over cartilages.

Ques. 3. What are the uses of the periosteum ?

Ans. The periosteum strengthens the union of bones with their epiphyses, affords attachments for ligaments and muscles, permits the muscles to glide smoothly over the bones, and conducts and supports vessels in their passage to the bones.

Ques. 4. What is the periosteum internus ?

Ans. A delicate membrane which lines the internal cavities of bones.

Ques. 5. What is the use of the periosteum internus ?

Ans. It forms little sacs to contain the marrow.

Ques. 6. What are the general classes of bones ?

Ans. Bones are divided into three classes ; viz., the

long or cylindrical; the broad or flat; and the mixed bones.

Ques. 7. What are the epiphyses of bones?

Ans. The name of epiphyses has been given to the extremities and great projections of the bones in the fœtus, which at this time are united to the body of the bones by cartilages.

Ques. 8. What is the general structure of epiphyses?

Ans. Their internal structure is spongy.

Ques. 9. What are the diaphyses of bones?

Ans. The middle portions of the long bones placed between the epiphyses are called diaphyses.

Ques. 10. What is the general structure of diaphyses internally?

Ans. Their interior is reticular.

Ques. 11. What is the general structure of diaphyses externally?

Ans. Their exterior is compact.

Ques. 12. What are the apophyses of bones?

Ans. Apophyses are great projections, or distinct portions of bones.

Ques. 13. How do apophyses differ from epiphyses?

Ans. They are distinguished from epiphyses in being less easily separable from the bone to which they belong—no layer of cartilages being interposed between them. The epiphyses of the fœtus become apophyses in the adult.

Ques. 14. What is the intimate structure of all bones?

Ans. Bones consist of a cellular, reticular, and vascular parenchyma; and of osseous matter deposited in it: their base, therefore, being the same with that of the muscles, nerves, and soft parts of the body.

Ques. 15. Are bones formed in fibres, plates, or lamellæ?

Ans. They are not.

Ques. 16. Are bones vascular?

Ans. They are at all times vascular ; but they are more especially so during the ossific process.

Ques. 17. Where do their vessels enter ?

Ans. By numerous small foramina all over their external surface.

Ques. 18. What is the best demonstration of the vascularity of bones ?

Ans. Their vascularity is proved by the tinge which they receive in animals with whose food the rubia tinctorum or madder has been mixed. Some very fine specimens of injection, prepared by Professor Horner, are to be found in the Wistar Museum attached to the University of Pennsylvania.

Ques. 19. What is the medulla of bones ?

Ans. The medulla is an oleaginous fluid deposited in their internal cells.

Ques. 20. How is it secreted ?

Ans. It is secreted by minute arteries which ramify upon the sacs of the internal periosteum.

Ques. 21. Where do the medullary arteries of bones penetrate them ?

Ans. They generally penetrate the bones about their middle by oblique canals.

Ques. 22. What is the use of the medulla ?

Ans. The use of the medulla is not accurately ascertained. In Soemmering's opinion it tends to render the bones comparatively lighter.

Ques. 23. What names are given to the different parts of bones ?

Ans. The external parts of bones are the following : foramina, canals, sinuses, sinuosities, furrows, notches, fossæ, pits, glenoid cavities, cotyloid cavities, tubercles, tuberosities, spines, heads, necks, processes, &c.

Ques. 24. What are foramina ?

Ans. Foramina are holes perforating the substance of

bones, without leaving any long track within their substance.

Ques. 25. What are canals?

Ans. Canals are foramina contained within the substance of bones?

Ques. 26. What are sinuses?

Ans. Sinuses are great cavities in bones with small openings.

Ques. 27. What are sinuosities?

Ans. Sinuosities are superficial, but broad irregular depressions.

Ques. 28. What are furrows?

Ans. Furrows are long, narrow, and superficial canals.

Ques. 29. What are notches?

Ans. Notches are cavities in the margin of bones.

Ques. 30. What are fossæ?

Ans. Fossæ are deep and large cavities upon their surface.

Ques. 31. What are pits?

Ans. Pits are small though deep depressions.

Ques. 32. What are glenoid cavities?

Ans. Glenoid cavities are smooth shallow cavities for articulation.

Ques. 33. What are cotyloid cavities?

Ans. Cotyloid cavities are deep and smooth for articulation.

Ques. 34. What are tubercles?

Ans. Tubercles are small eminences.

Ques. 35. What are tuberosities?

Ans. Tuberosities are greater, rough elevations.

Ques. 36. What are spines?

Ans. Spines are long projections.

Ques. 37. What are heads?

Ans. Heads are the round tops of bones.

Ques. 38. What are necks?

Ans. Necks are the narrow portions of bones beneath their heads.

Ques. 39. What are processes ?

Ans. Processes are projecting portions of bones.

SECTION III.

OF ARTICULATION IN GENERAL.

Ques. 1. What is the articulation of bones ?

Ans. The connexion of bones with each other is called articulation : which is divided into three classes.

Ques. 2. What are the general classes of articulation ?

Ans. The general classes of articulations are symphysis, synarthrosis, and diarthrosis.

Ques. 3. What is symphysis ?

Ans. Symphysis expresses the substance connecting bones.

Ques. 4. What is synarthrosis ?

Ans. Synarthrosis expresses the immoveable connexion of bones.

Ques. 5. What is diarthrosis ?

Ans. Diarthrosis means the moveable connexion of bones.

Ques. 6. What are the subdivisions of symphysis ?

Ans. Symphysis is subdivided into synostosis, syndesmosis, synchondrosis, and syssarcosis.

Ques. 7. What are the genera of synarthrosis ?

Ans. Synarthrosis is subdivided into suture, harmonia, schindylesis and gomphosis.

Ques. 8. What are the genera of diarthrosis ?

Ans. Diarthrosis is subdivided into enarthrosis, arthrodia, amphiarthrosis, and ginglymus.

Ques. 9. What is synostosis ?

Ans. Synostosis means the conjunction of bones by osseous matter ; as that of the sphenoid and occipital.

Ques. 10. What is syndesmosis ?

Ans. It expresses conjunction by ligaments as in all moveable joints.

Ques. 11. What is synchondrosis ?

Ans. Synchondrosis expresses conjunction by cartilage ; as that of the ribs and sternum.

Ques. 12. What is syssarcosis ?

Ans. Syssarcosis expresses conjunction by muscles : as in all moveable joints.

Ques. 13. What is syneurosis ?

Ans. Syneurosis expresses conjunction by membranes ; as that of the radius and ulna.

Ques. 14. What is meant by suture ?

Ans. Suture expresses conjunction by indented margins ; as that of the two parietal bones.

Ques. 15. What is meant by harmonia ?

Ans. It expresses conjunction by straighter margins ; as that of the ossa nasi.

Ques. 16. What is meant by schindylesis ?

Ans. It is that articulation where the spine of one bone is received into the furrow of another ; as the vomer receives the azygos process of the sphenoid bone.

Ques. 17. What is gomphosis ?

Ans. It is that conjunction by which the teeth are placed in the sockets.

Ques. 18. What is enarthrosis ?

Ans. It expresses the reception of the head of one bone

by a deep cavity in another; as the acetabulum receives the head of the femur.

Ques. 19. What is arthrodia?

Ans. Arthrodia expresses the reception of the head of one bone by a superficial cavity of another; as the glenoid cavity of the scapula receives the head of the humerus.

Ques. 20. What is amphiarthrosis?

Ans. It expresses conjunction of bones by plain surfaces; as those of the cuneiform and metatarsal bones.

Ques. 21. What is meant by ginglymus articulation?

Ans. Ginglymus expresses the hinge-like articulation; as that of the elbow joint, of which there are three kinds; namely, ginglymus simplex, ginglymus compositus; and ginglymus trochoides.

Ques. 22. What is ginglymus simplex?

Ans. Ginglymus simplex is that species where corresponding, elevated, and depressed surfaces constitute one joint; as that of the elbow.

Ques. 23. What is ginglymus compositus?

Ans. It is that species where two different hinge-like joints serve one purpose; as in the articulation of the radius and ulna.

Ques. 24. What is ginglymus trochoides?

Ans. It is that species where one bone turns round the point of another; as the atlas moves upon the process of the dentata.

SECTION IV.

OF OSTEOGENY.

Ques. 1. What is the name of that division of anatomy which treats of the growth of bones ?

Ans. Osteogeny.

Ques. 2. How are bones formed ?

Ans. They are formed by the deposition of ossific matter, either in membranes or cartilage.

Ques. 3. What are the constituent parts of bones ?

Ans. Their constituent parts are a cellular and vascular parenchyma, and a phosphate of lime with other saline combinations.

Ques. 4. What are the phenomena of ossification ?

Ans. Ossification is thus effected: the arteries of the part about to undergo this process become dilated; though formerly transparent they now assume a red colour; the cartilage itself is not transmuted into bone, but becomes gradually absorbed whilst the ossific matter is deposited in its place.

Ques. 5. How does ossification take place in the diaphysis of long bones ?

Ans. In the diaphysis of long bones this process begins in the middle, forming flat rings between the external and internal periosteum.

Ques. 6. How does ossification take place in the epiphysis of long bones ?

Ans. At their epiphyses in distinct points, which gradually unite.

Ques. 7. How does ossification take place in the bones of the cranium ?

Ans. It assumes the appearance of radii diverging from a centre.

Ques. 8. What bones are perfectly formed at birth?

Ans. The small bones of the ear.

Ques. 9. What bones are the latest ossified?

Ans. The epiphyses.

Ques. 10. When does ossification in the epiphyses terminate?

Ans. About seven or eight years of age.

Ques. 11. At what period are the epiphyses united to the diaphyses?

Ans. About twenty years of age they are converted into apophyses by bony union with the diaphyses.

SECTION V.

OF THE HEAD AND ITS SUTURES.

Ques. 1. How are the bones of the head divided?

Ans. The bones of the head are divided into those belonging to the cranium and those belonging to the face.

Ques. 2. What is the general structure of the bones of the cranium?

Ans. The bones of the cranium consist of two tables or bony plates, and an intermediate diploe.

Ques. 3. Which of its tables is thickest?

Ans. The external table is thickest.

Ques. 4. What is the diploe of the bones of the cranium ?

Ans. It is of a cellular structure, like the epiphyses of the long bones.

Ques. 5. What is the name of the membrane covering the cranium ?

Ans. Pericranium is the name given to the periosteum of these bones.

Ques. 6. What is the structure of the bones of the face ?

Ans. The bones of the face are of an irregular structure.

Ques. 7. Enumerate the bones of the cranium.

Ans. They are eight in number : the os frontis, two ossa parietalia, two ossa temporum, os occipitis, os sphenoides, and os æthmoides.

Ques. 8. What bones are proper to the cranium ?

Ans. Five : two parietal, two temporal, and the occipital.

Ques. 9. What bones are common to the cranium and face ?

Ans. Three ; os frontis, sphenoid, and æthmoid.

Ques. 10. What bones are proper to the face ?

Ans. There are fourteen : two ossa nasi, two ossa lacrymalia, two ossa malarum, two ossa maxillaria superiora, two ossa palati, two ossa turbinata inferiora, vomer, and os maxillare inferius.

Ques. 11. What is the situation of the os frontis ?

Ans. The os frontis is situated in the anterior part of the cranium.

Ques. 12. Where are the parietal bones ?

Ans. In the upper and lateral parts of the cranium.

Ques. 13. Where are the temporal bones ?

Ans. In the lower and lateral parts, and partly in the base of the cranium.

Ques. 14. Where is the os occipitis ?

Ans. In the base and back of the cranium.

Ques. 15. In what part of the cranium is the os sphenoides ?

Ans. In the middle of the base, and partly on the sides.

Ques. 16. Where is the os æthmoides ?

Ans. In the middle of the forepart of the base of the cranium.

Ques. 17. Where are the ossa nasi ?

Ans. In the arch of the nose.

Ques. 18. Where are the ossa lachrymalia, or ossa unguis ?

Ans. In the anterior part of the nasal sides of the orbits ?

Ques. 19. Where are the ossa malarum ?

Ans. In the upper part of the face.

Ques. 20. Where are the ossa maxillaria superiora ?

Ans. In the middle of the face, constituting the upper jaw.

Ques. 21. Where are the ossa palati situated ?

Ans. In the back of the orbits, nares, and palate.

Ques. 22. Where are the ossa turbinata inferiora ?

Ans. In the lower part of the sides of the nares.

Ques. 23. Where is the vomer situated ?

Ans. In the middle of the nares.

Ques. 24. What are the sutures of the cranium ?

Ans. The sutures formed by the union of the bones of the cranium, are five in number : the coronal, the sagittal, the lambdoidal, and the two squamous.

Ques. 25. What sutures connect the bones of the cranium and face ?

Ans. The sphenoidal, æthmoidal, transverse, and the two zygomatic sutures.

Ques. 26. What are the harmonia of the face ?

Ans. They are sixteen in number : one perpendicular nasal, two lateral nasal, two lachrymal, two transverse

nasal, two external orbital, one mystachial, one transverse palatine, one longitudinal palatine, two maxillo palatine.

Ques. 27. Describe the coronal suture.

Ans. The coronal suture stretches from above an inch behind the temporal side of one orbit, above the superior part of the cranium, to the same place on the other, connecting the two parietal bones to the frontal bone.

Ques. 28. Describe the sagittal suture.

Ans. The sagittal suture extends along the top of the head, from the middle of the coronal to considerably behind the vertex, connecting the parietal bones.

Ques. 29. Describe the lambdoidal suture.

Ans. It begins at the termination of the sagittal, and passes, in the form of the Greek letter Λ , forward and downward on each side, connecting the occipital bone to the parietal bones.

Ques. 30. Describe the squamous sutures.

Ans. The squamous sutures are of a semicircular form, situated higher upon the cranium than the top of the external ear, connecting on each side the upper edge of the os squamosum, to the lower edge of the os parietale, which it overlaps.

Ques. 31. What are the additamenta suturæ lambdoidalis?

Ans. The continuations on each side of the lambdoidal suture into the base of the cranium, are called the additamenta suturæ lambdoidalis.

Ques. 32. What are the additamenta suturæ squamosæ?

Ans. The posterior seriated portions of the squamous sutures are called its additamenta.

Ques. 33. Describe the sphenoidal suture.

Ans. The sphenoidal suture surrounds all the edges of the sphenoid bone.

Ques. 34. Describe the æthmoidal suture.

Ans. The æthmoidal suture surrounds all the edges of the bone of the same name.

Ques. 35. Describe the transverse suture.

Ans. The transverse suture extends through the orbits, between the cranium and face, and joins the cranial and facial bones.

Ques. 36. Describe the zygomatic suture.

Ans. The zygomatic suture is situated rather towards the anterior part of the zygoma; it runs from above downward and backward, connecting the zygomatic processes of the temporal and cheek bones.

Ques. 37. Describe the perpendicular nasal harmonia.

Ans. The perpendicular nasal harmonia is situated in the middle of the nasal arch, connecting the two ossa nasi.

Ques. 38. Describe the lateral nasal harmonia.

Ans. The lateral nasal harmonia are situated on each side of the nasal arch, connecting the ossa nasi to the ossa maxillaria.

Ques. 39. Describe the lachrymal harmonia.

Ans. The lachrymal harmonia surrounds the forepart of the ossa lachrymalia, connecting them to the ossa maxillaria.

Ques. 40. Describe the transverse nasal harmonia.

Ans. The transverse nasal harmonia are situated at the lower part of the nares, internally connecting the ossa turbinata inferiora to the ossa maxillaria.

Ques. 41. Describe the external orbital harmoniæ.

Ans. The external orbital harmoniæ extend from the middle of the lower side of each orbit downward and outward, to the lower part of each os malæ, connecting these bones to the ossa maxillaria.

Ques. 42. Describe the internal orbital harmoniæ.

Ans. The internal orbital harmoniæ extend from the middle of the inferior edge of each orbit to the lower an-

terior part of the speno-maxillary fissure, connecting the ossa malarum to the ossa maxillaria.

Ques. 43. Describe the mystachial harmonia.

Ans. They connect the maxillary bones immediately beneath the anterior aperture of the nostrils.

Ques. 44. Describe the transverse palatine harmonia.

Ans. It stretches across the back of the palate, connecting the palatine processes of the palate bones to those of the superior maxillary bones.

Ques. 45. Describe the longitudinal palatine harmonia.

Ans. They extend from the middle of the anterior to the middle of the posterior part of the palate, connecting the palatine processes of the maxillary and palatæ bones of the one side to those of the other.

Ques. 46. Describe the maxillo palatine harmoniæ.

Ans. They are situated at the back of the sides of the nares, connecting the palate bones to the bulbous processes of the superior maxillary bones.

Ques. 47. What bones of the face does schyndylesis connect?

Ans. The vomer is connected with the os sphenoides above, and with the palatine and superior maxillary bones below, by schyndylesis.

Ques. 48. What bones of the face does gomphosis connect?

Ans. The connexion betwixt the teeth and their sockets is an instance of gomphosis.

SECTION VI.

OF THE BONES OF THE HEAD.

Os Frontis.

Ques. 1. What is the situation of the os frontis ?

Ans. The os frontis is situated in the anterior part of the cranium, and superior part of the face.

Ques. 2. How is the os frontis divided ?

Ans. It is divided into a frontal and facial portion.

Ques. 3. What is the situation and general form of its frontal portion ?

Ans. It is situated superiorly, being concave internally and convex externally, its upper edge being semicircular, and possessing a double row of small serræ.

Ques. 4. What is the situation and general form of its facial portion ?

Ans. It is situated inferiorly, and is of a very irregular form.

Ques. 5. What are the elevations of the os frontis ?

Ans. The following, two internal angular processes at the insides of the orbits ; a nasal process between these ; two superciliary ridges forming arches, the inner ends of which rest on the internal angular processes, and the outer ends upon the two external angular processes at the outer edge of each orbit ; a temporal process and ridge immediately behind the external angular process ; two orbital plates, or processes, which run back from the superciliary ridges ; two bumps of the frontal sinuses, which are placed immediately above the internal angular processes and eminences, some way above the middle of

the superciliary ridges, which were the points of its ossification:—all these elevations are situated externally, except the orbital plates, which project internally, where also the spine, ascending from the root of the nose to the middle of the semicircular edge of the bone, may be seen.

Ques. 6. What muscles are attached to its internal angular processes ?

Ans. The trochlearis, internally by means of its pulley, and externally the corrugator supercilii are attached to the internal angular process.

Ques. 7. What are attached to its temporal ridges ?

Ans. The origin of the temporalis, and its tendinous aponeurosis.

Ques. 8. What is attached to its spine ?

Ans. The falx cerebri ; a duplicature of the dura mater.

Ques. 9. What are situated above its orbital plates ?

Ans. The anterior lobes of the brain rest on the orbital plates.

Ques. 10. What are the depressions of the os frontis ?

Ans. They are its orbital depressions in the orbital plates ; its lachrymal depressions situated on the same plates, and behind its external angular processes ; its depressions for the pulleys of the trochleares on the inside of its internal angular processes ; its æthmoidal fissure between its orbital plates ; its temporal depressions behind its processes of the same name ; the great concavity of the internal side of the bone ; and a furrow along its spine.

Ques. 11. What are situated in its lachrymal depressions ?

Ans. The lachrymal glands.

Ques. 12. What is situated in its æthmoidal fissure ?

Ans. The cribriform plate of the æthmoid bone.

Ques. 13. What are situated in its temporal depressions ?

Ans. The temporal muscles.

Ques. 14. What is situated in the furrow of its spine ?

Ans. The anterior part of the longitudinal sinus : a great vein of the dura mater.

Ques. 15. What are the foramina of the os frontis ?

Ans. Externally two, called superciliary from their being situated about one-third from the inner end of the superciliary ridges ; and internally one, called cœcum, situated at the root of the spine.

Ques. 16. What is transmitted through its superciliary foramen ?

Ans. They transmit to the forehead twigs of the ophthalmic nerve, artery, and vein.

Ques. 17. What is transmitted occasionally through the foramen called cœcum ?

Ans. An artery and vein occasionally pass to the nose.

Ques. 18. What is fixed in the foramen cœcum ?

Ans. A small process of the dura mater.

Ques. 19. What is the fœtal state of this bone ?

Ans. In the fœtus it is divided down its middle ; it contains no sinuses ; and neither the orbital plates, nor the superciliary ridges, are complete in it.

Ques. 20. What are the connexions of this bone ?

Ans. It is connected superiorly to the parietal bones by the coronal suture ; posteriorly and inferiorly to the sphenoid bone by the sphenoidal suture ; and inferiorly to the bones of the face by the transverse suture.

Ques. 21. What are the uses of this bone ?

Ans. It constitutes the forehead and upper part of the face ; it supports and defends the anterior lobes of the brain ; and forms a great part of the orbits.

Os Parietale.

Ques. 22. What is the situation of the os parietale ?

Ans. It is situated at the superior and lateral part of the skull ?

Ques. 23. What is its general form ?

Ans. It is of a quadrangular form ; convex externally, and concave internally.

Ques. 24. What are the names of its sides ?

Ans. Its edges are one superior, one inferior, one anterior, and one posterior.

Ques. 25. What are the names of its angles ?

Ans. One anterior superior, one anterior inferior, one posterior superior, and one posterior inferior.

Ques. 26. What are the elevations of the os parietale ?

Ans. Two externally, viz. : a semicircular ridge, somewhat less than half way up the bone, and in the middle of the bone just above that ridge, an eminence which was its foetal point of ossification.

Ques. 27. What is attached to its temporal ridge ?

Ans. The temporal muscle.

Ques. 28. How do you distinguish the bone of one side from that of the other ?

Ans. When the convexity of the right parietal bone is turned outward, and its longest and most pointed angle is turned forward and downwards, the bone will be placed in the situation it holds in the body, and thus the side to which it belongs may be ascertained.

Ques. 29. What are the depressions of the os parietale ?

Ans. They are the great concavity of its inner side, a furrow on the inside of its upper edge, a furrow on the inside of its inferior posterior angle, a furrow on the inside of its anterior inferior angle, and frequently pits on its external surface.

Ques. 30. What is situated in the furrow on the inside of its upper edge ?

Ans. The middle portion of the longitudinal sinus.

Ques. 31. What is situated in the furrow on the inside of its inferior posterior angle ?

Ans. The middle portion of the lateral sinus.

Ques. 32. What is situated in the furrow on the inside of its anterior inferior angle ?

Ans. The anterior branch of the arteria meningea media, or spinous artery.

Ques. 33. What is contained in the pits frequently seen on its internal surface ?

Ans. Vessels passing to or from the bone, and the convolutions of the brain.

Ques. 34. What are the foramina of the os parietale ?

Ans. There is only one foramen in this bone, which is placed towards the posterior part of its upper edge, and transmits an artery to the dura mater, and a vein to the longitudinal sinus.

Ques. 35. What is the fœtal state of this bone ?

Ans. Its angles are unformed, its sides are incomplete, nor does its foramen exist in the fœtal state.

Ques. 36. What are the connexions of this bone ?

Ans. It is connected to its fellow by the sagittal suture, to the os frontis by the coronal suture, to the os temporis by the squamous suture, to the os occipitis by the lambdoidal suture, and by its anterior inferior angle, with the os sphenoides.

Ques. 37. What are the uses of this bone ?

Ans. It constitutes the upper and lateral part of the skull, and protects the middle lobes of the brain.

Os Temporis.

Ques. 38. What is the situation of the os temporis ?

Ans. It is situated at the lower part of the side and base of the cranium.

Ques. 39. How is it divided ?

Ans. Into three portions, the squamous, the petrous, and the mamillary.

Ques. 40. What is the situation and general form of its squamous portion ?

Ans. It is placed uppermost, is smooth externally, and has a semicircular edge.

Ques. 41. What is the situation and general form of its mamillary portion ?

Ans. It is situated posteriorly, and is less regular and thin than the squamous.

Ques. 42. What is the situation and general form of its petrous portion ?

Ans. It is placed inferiorly and internally, and is the least regular of all.

Ques. 43. What are the elevations of the os temporum ?

Ans. They are its mamillary process, projecting downward from the portion of that name ; its zygomatic process standing outwards and forwards from the squamous portion, and having a smooth tubercle placed at the anterior inferior part of its base ; its styloid process projecting downwards and forwards from the petrous portion ; its vaginal process placed between the mastoid, styloid, and zygomatic ; and the ridge internally on the upper part of its petrous portion.

Ques. 44. What is the internal structure of its mamillary process ?

Ans. It is cellular.

Ques. 45. What muscles are attached to it ?

Ans. The sterno-cleido-mastoideus, and the trachelo-mastoideus.

Ques. 46. What is attached to the upper edge of the zygomatic process ?

Ans. The aponeurosis of the temporal muscle.

Ques. 47. What is attached to the lower edge of that process ?

Ans. A part of the masseter muscle.

Ques. 48. What passes under that process ?

Ans. The temporal muscle.

Ques. 49. What is the use of the tubercle situated at its base ?

Ans. It constitutes a part of the joint of the lower jaw.

Ques. 50. What is attached to the styloid process ?

Ans. The stylo-hyoideus, the stylo-glossus, and the stylo-pharyngeus muscles : a ligament to the os hyoides ; and the lateral ligament of the lower jaw ; are also attached to the styloid process.

Ques. 51. What is attached to the auditory process ?

Ans. The cartilage of the meatus auditorius externus.

Ques. 52. What is attached to the edge of its petrous portion ?

Ans. Part of the tentorium ; a duplicature of the dura mater.

Ques. 53. What are the depressions of the os temporis ?

Ans. They are the glenoid cavity, for the articulation of the lower jaw ; the fissura glasseri, traversing the middle of that depression ; a fossa, behind the mastoid process ; a thimble-like cavity, internal to its styloid process, constituting part of the jugular foramen ; a depression before its zygomatic process, called the temporal ; a furrow on the inside of its mamillary portion ; a furrow above, and another below the posterior surface of its petrous portion.

Ques. 54. What is situated in the articular cavity of the bone ?

Ans. Anteriorly the condyle of the jaw, and posteriorly a part of the parotid gland.

Ques. 55. What passes through the fissura glasseri ?

Ans. The laxator tympani major, and chorda tympani.

Ques. 56. To what does the groove behind the mastoid process give attachment ?

Ans. The origin of the digastricus muscle.

Ques. 57. What does the jugular foramen transmit ?

Ans. Posteriorly the jugular vein, and anteriorly the

par vagum or pneumo-gastric nerve, the glosso-pharyngeal nerve, and the accessory nerve of Willis.

Ques. 58. What is lodged in the temporal depression ?

Ans. The temporal muscle.

Ques. 59. What is situated in the furrow on the inside of its mamillary portion ?

Ans. Part of the lateral sinus.

Ques. 60. What is situated in the furrows at the upper and lower edges of the posterior surface of its petrous portion ?

Ans. The superior and inferior petrosal sinuses.

Ques. 61. What are the foramina of the os temporis ?

Ans. They are externally, the meatus auditorius externus, the foramen stylo-mastoideum, or opening of the Fallopian aqueduct, the foramen carotideum, the bony canal of the eustachian tube, the canal which contains the tensor tympani, the foramen mastoideum; internally, the meatus auditorius internus, which divides into the Fallopian aqueduct superiorly and the tractus cochlea inferiorly; a small foramen is situated on the superior surface of the posterior surface of the petrous portion. The foramen common to this bone and the sphenoid is placed at the anterior part of its petrous portion.

Ques. 62. How are these foramina situated ?

Ans. The meatus auditorius externus is placed between its mastoid and zygomatic processes; the foramen stylo-mastoideum between the styloid and mastoid processes; the foramen carotideum at the base of the petrous portion; the bony canal of the eustachian tube, at the external side of the petrous portion; the canal which contains the tensor tympani, immediately before the last mentioned; the foramen mastoideum, behind the mastoid process; the meatus auditorius internus, on the posterior surface of the petrous portion; the opening of the aqueductus cochlea behind the edge of the posterior surface of the petrous portion, immediately below the meatus; the opening of the aque-

ductus vestibuli, on the posterior surface of the petrous portion, about five lines behind.

Ques. 63. What passes through the stylo-mastoid foramen?

Ans. The portio dura or facial nerve passes outward, and an artery enters to the ear.

Ques. 64. What does the canalis carotideus transmit?

Ans. It transmits the carotid artery, and the beginning of the intercostal nerve.

Ques. 65. What does the foramen mastoideum transmit?

Ans. It transmits an artery to the dura mater, and a vein to the lateral sinus.

Ques. 66. What does the meatus auditorius internus transmit?

Ans. It transmits the portio dura and mollis, or the facial and auditory nerve.

Ques. 67. What is transmitted by the Fallopian aqueduct?

Ans. It transmits the continuation of the facial nerve.

Ques. 68. What does the small foramen on the superior surface of the petrous portion transmit?

Ans. It transmits the Vidian nerve to join the portio dura.

Ques. 69. What is the fœtal state of this bone?

Ans. In the fœtal state there exists in this bone no meatus auditorius externus, but merely a bony ring, nor are the styloid processes formed.

Ques. 70. What are the connexions of this bone?

Ans. It is connected anteriorly to the sphenoid bone by the sphenoidal suture, superiorly to the parietal by the squamous suture and its additamentum, posteriorly to the occipital by the lambdoidal suture and its additamentum, and to the lower jaw by ginglymus.

Ques. 71. What are the uses of this bone?

Ans. It constitutes the inferior lateral parts of the cra-

nium, supports on each side the middle lobes of the brain, transmits several vessels and nerves, and contains the organ of hearing.

Os Occipitis.

Ques. 72. What is the situation of the os occipitis?

Ans. It is situated in the inferior and posterior part of the cranium.

Ques. 73. What is its general form?

Ans. It is irregularly rhomboidal, its inferior angle projecting forwards, which part is called the cuneiform process—its superior angle is rounded, and its lateral angles obtuse; it is concave internally, and convex externally.

Ques. 74. What are the elevations of the os occipitis?

Ans. They are its condyles—projections situated on each side, and somewhat anteriorly to the great foramen in the middle of the bone—a rough protuberance external to each of them; the elevated edges of the great foramen; a longitudinal ridge on the posterior part of the bone; a superior and an inferior transverse ridge crossing the longitudinal one; a spine in the middle of the superior transverse ridge: internally it has a longitudinal and a transverse ridge, which cross each other, and are denominated its internal crucial spine.

Ques. 75. With what are its condyles connected?

Ans. With the oblique processes of the atlas.

Ques. 76. What muscles are fixed to the protuberances external to the condyles?

Ans. The recti laterales.

Ques. 77. What is fixed to the anterior edge of the great foramen?

Ans. The perpendicular ligament of the second vertebra, and that of the anterior arch of the atlas.

Ques. 78. What is fixed to its posterior ridge?

Ans. The ligament of the posterior arch of the atlas.

Ques. 79. What is fixed to its superior transverse ridge and spine ?

Ans. The occipito frontales and the trapezii muscles.

Ques. 80. What is fixed to its inferior transverse ridge ?

Ans. The recti majores postici, and externally to them the obliqui superiores.

Ques. 81. What is fixed to the upper portion of its internal crucial ridge ?

Ans. The posterior part of the falx cerebri.

Ques. 82. What is fixed to the lateral portions of its internal crucial ridge ?

Ans. The tentorium ; a duplicature of the dura mater.

Ques. 83. What is fixed to its inferior portion ?

Ans. The falx cerebelli ; a duplicature also of the dura mater.

Ques. 84. What are the depressions of the os occipitis ?

Ans. They are one below each superior transverse ridge ; one below each side of its superior transverse ridge ; one on the outside of each condyle which contribute to form the jugular foramina ; a small depression anterior to each of these ; a furrow in the upper portion of the internal crucial spine ; a furrow in the inferior portion ; a furrow in each lateral portion of the same spine ; a depression on each side of the superior portion ; one on each side of the inferior portion of the same spine ; a furrow immediately anterior to each of these ; a great depression on the superior surface of the cuneiform process ; and a small furrow on each side of that depression.

Ques. 85. What is fixed to the hollow between the two external transverse ridges ?

Ans. Internally the complexi, and externally the splenii muscles.

Ques. 86. What is fixed to the depression below its inferior external transverse ridge.

Ans. The recti minores postici muscles.

Ques. 87. What do the semilunar depressions external to the condyles contribute to form?

Ans. The jugular foramina are in part formed by them.

Ques. 88. What is fixed to the small depressions before the condyles?

Ans. The recti minores antici muscles.

Ques. 89. What are fixed to the small depressions anterior to the last?

Ans. The recti majores antici muscles.

Ques. 90. What is situated in the furrow of the upper portion of its internal crucial ridge?

Ans. The posterior part of the longitudinal sinus.

Ques. 91. What are situated in the furrows of the lateral portions of its crucial internal ridge?

Ans. The first parts of the lateral sinuses.

Ques. 92. What is situated in the furrow of the inferior portion of its internal crucial ridge?

Ans. The occipital sinus.

Ques. 93. What are situated in the great depressions above the lateral portions of its internal crucial ridge?

Ans. The posterior lobes of the cerebrum.

Ques. 94. What are situated in the great depressions below the lateral portions of its internal crucial ridge?

Ans. The lobes of the cerebellum.

Ques. 95. What are situated in the furrows immediately before these inferior depressions?

Ans. The terminations of the lateral sinuses.

Ques. 96. What is situated in the great depression of the superior surface of the cuneiform process.

Ans. The medulla oblongata.

Ques. 97. What are situated in the small furrows on each side of that great depression?

Ans. The inferior petrosal sinuses.

Ques. 98. What are the foramina of the os occipitis?

Ans. They are the foramen magnum, immediately behind the cuneiform process; the foramina condyloidea posteriora, immediately behind the condyles; and the foramina condyloidea anteriora, immediately before the condyles.

Ques. 99. What does the foramen magnum transmit?

Ans. The medulla spinalis, the nervi accessorii, the vertebral arteries, and sometimes the vertebral veins.

Ques. 100. What does the foramen condyloideum posterius transmit?

Ans. They transmit the cervical nerves and the lateral sinus.

Ques. 101. What does the foramen condyloideum anterius transmit?

Ans. The ninth pair of nerves to the tongue.

Ques. 102. What is the fœtal state of this bone?

Ans. The cuneiform process, the two sides of the great foramen, and all the bone posterior to it, are easily in the fœtal state separable into four portions.

Ques. 103. What are the connexions of this bone?

Ans. It is connected anteriorly to the sphenoid bone by synostosis; inferiorly to the atlas by ginglymus compositus; laterally to the temporal bones by the additamenta of the lambdoidal sutures; and superiorly to the parietal bones by the lambdoidal suture itself.

Ques. 104. What are the uses of this bone?

Ans. It forms the posterior, and a part of the inferior portion of the cranium; it contains and defends the posterior lobes of the cerebrum, the cerebellum, and medulla oblongata; and gives exit to the spinal marrow.

Os Sphenoides.

Ques. 105. What is the situation of the os sphenoides?

Ans. It passes from one temple to another, across the middle of the base of the cranium.

Ques. 106. What are its general divisions ?

Ans. It is divided into a body situated in the middle, an ala on each side of it ; and two pterygoid portions at its inferior part.

Ques. 107. What are the elevations of this bone ?

Ans. They are the processes azygos, standing forward and downward from its body ; the posterior clinoid processes, one on each side placed anterior to these ; the transverse spinous processes, which are lateral continuations of the anterior clinoid ; the æthmoidal process, projecting anteriorly between the two last ; the orbital process, portions of the ala turned towards the orbits ; the temporal processes, portions of the ala turned towards the temples ; the spinous processes, which are posterior parts of the ala ; the styliform processes, which project downward from the points of the spinous ; the external pterygoid plate, which is the outer part of the pterygoid portions ; and the internal pterygoid plate, surmounted by a hook-like process, forming the inner part of the pterygoid portions.

Ques. 108. What is attached to its processus azygos ?

Ans. The vomer.

Ques. 109. What is attached to the internal side of its external pterygoid plate ?

Ans. The pterygoideus externus.

Ques. 110. What passes over the hook-like process of its internal pterygoid plate ?

Ans. The tendon of the tensor palati.

Ques. 111. What are the depressions of the os sphenoides ?

Ans. They are one on each side of its processus azygos ; one between its clinoid process, called the sella turcica ; a furrow on each side of that ; depressions on its orbital processes ; depressions on its temporal pro-

cesses ; a furrow on the anterior edge of the last ; a depression between the temporal process and the pterygoid portion of the bone ; the great superior concavities of the alæ ; a furrow internal to the base of the pterygoid portions ; a small cavity behind the base of the internal pterygoid process ; and the fossa pterygoidea between the pterygoid processes.

Ques. 112. What are the depressions on each side of the processus azygos ?

Ans. They constitute a portion of the nares.

Ques. 113. What is situated in the sella turcica ?

Ans. The pituitary gland.

Ques. 114. What are situated in the furrows at its sides ?

Ans. The carotid arteries.

Ques. 115. What is situated in its temporal depression ?

Ans. The temporal muscle.

Ques. 116. What passes in the furrow on the anterior edge of its temporal depression ?

Ans. A nerve from the superior maxillary to the temporal muscle.

Ques. 117. What is placed in the depression between the temporal and the pterygoid processes of the bone ?

Ans. The pterygoideus externus muscle.

Ques. 118. What rests upon the internal cavity of each ala ?

Ans. A middle lobe of the brain on each ala.

Ques. 119. What passes in the furrow internal to the base of the pterygoid portion of the bone ?

Ans. An artery, vein, and nerve pass to the nares.

Ques. 120. What is situated in the cavity behind the base of the internal pterygoid process ?

Ans. Part of the eustachian tube.

Ques. 121. What is situated in the fossa pterygoidea ?

Ans. The pterygoideus internus muscle.

Ques. 122. What are the foramina of this bone ?

Ans. They are anteriorly the openings of its sinuses on each side of the processus azygos ; the foramina optica internal to its anterior clinoid processes ; the foramina lacera, placed between the transverse spinous processes and the roots of its ala ; the foramina rotunda, placed immediately below the former ; the foramina ovalia, placed somewhat externally and posteriorly to the last ; the foramina spinosa, placed posteriorly to these ; and the foramina vidia, which perforate the base of each pterygoid portion from before backward.

Ques. 123. What are the uses of the sphenoidal sinuses ?

Ans. They serve to increase the tone of the voice.

Ques. 124. What passes through the foramina optica ?

Ans. The optic nerves and the ophthalmic arteries.

Ques. 125. What do the foramina lacera transmit ?

Ans. The third, fourth, first branch of the fifth, and the sixth pair of nerves, except a reflected twig, which is supposed to form the commencement of the great sympathetic nerve.

Ques. 126. What passes through the foramina rotunda ?

Ans. The second branches of the fifth pair, or the superior maxillary nerves.

Ques. 127. What does the foramina ovalia transmit ?

Ans. The third branch of the fifth pair, or the inferior maxillary.

Ques. 128. What passes through the foramen spinosum ?

Ans. The spinous artery, or arteria meningeae media to the dura mater.

Ques. 129. What passes through the Vidian foramen ?

Ans. An artery and vein pass to the nares, and through this foramen the Vidian nerve enters the cranium,

Ques. 130. What is the condition of this bone in the fœtal state ?

Ans. In the fœtus this bone has no sinuses, and is separable from its ala.

Ques. 131. What are the connexions of this bone ?

Ans. It is connected to the os frontis, os æthmoides, ossa malarum, ossa palati, ossa maxillaria, by the sphenoidal suture, and to the vomer, by schindylesis ; posteriorly to the os occipitis, by synostosis ; and laterally to the ossa parietalia, by its own suture.

Ques. 132. What are the uses of this bone ?

Ans. It forms some of the sides, and a considerable portion of the base of the cranium ; it supports the middle lobes of the brain ; it forms a part of the orbits ; it transmits numerous vessels and nerves, &c.

Os Æthmoides.

Ques. 133. What is the situation of the os æthmoides ?

Ans. It is situated in the middle of the anterior part of the base of the cranium.

Ques. 134. What is its general form ?

Ans. It is somewhat cubical.

Ques. 135. Of what portions does it consist ?

Ans. Of a cribriform lamella, a nasal lamella, two ossa plana, cellulæ, and two ossa turbinata.

Ques. 136. What is the situation of each of these portions ?

Ans. The cribriform lamella is situated horizontally in the base of the cranium ; the nasal lamella passes perpendicularly downward from the middle of it ; the ossa turbinata are situated at a little distance from the nasal lamella ; the cellulæ are immediately external to the ossa turbinata ; and the ossa plana are the most external of all.

Ques. 137. What is the name of the process which rises from the cribriform lamellæ; and to what does it give attachment?

Ans. The name of the process is the crista galli, and it gives attachment to the falx cerebri.

Ques. 138. What are the foramina of the cribriform lamella, and what do they transmit?

Ans. There are numerous holes for the transmission of the olfactory nerves in the cribriform plate.

Ques. 139. What are the foramina of the ossa turbinata superiora; and what do they transmit?

Ans. There are numerous holes in this portion, and are for the expansion of the olfactory nerve.

Ques. 140. What are the foramina of the ossa plana; and what do they transmit?

Ans. They are the foramina orbitaria interna, the anterior of which transmits the nasal twig of the first branch of the fifth pair of nerves, and a small branch of the ophthalmic artery; and the posterior a branch of the same artery.

Ques. 141. What are the connexions of this bone?

Ans. It is joined to the os frontis, ossa nasi, ossa maxillaria superiora, ossa palati, and the os sphenoides, by the æthmoidal suture; and to the vomer, by schindylesis.

Ques. 142. What is the fœtal state of this bone?

Ans. In a fœtus of nine months, the crista galli and nasal lamella not being ossified, the bone consists of two portions.

Ques. 143. What are its uses?

Ans. It supports the anterior lobes of the brain; gives attachment to the falx: transmits the olfactory nerves; and forms part of the septum nasi.

Os Nasi.

Ques. 144. What is the situation of the *os nasi*?

Ans. The *os nasi* is placed in the arch of the nose.

Ques. 145. What is the form of this bone?

Ans. It is somewhat convex externally, concave internally, narrow at its upper part, narrower still in the middle, and broadest at the base; its root and anterior edge is thickest, the latter projecting inward to join the septum; its outer edges superiorly are overlapped by the maxillary bones, and inferiorly overlap them; its lower edges are thin and irregular.

Ques. 146. What are its connexions?

Ans. It is connected superiorly to the frontal bone by the transverse suture, anteriorly to its fellow by the perpendicular nasal harmonia: externally to the superior maxillary bone, by the oblique nasal harmonia; posteriorly to the septum narium, by schindylesis; and inferiorly to the cartilages of the nose.

Ques. 147. What is its fœtal state?

Ans. In the fœtus it is proportionally shorter than in the adult.

Ques. 148. What is its use?

Ans. It covers and defends the nares.

Os Lachrymale.

Ques. 149. What is the situation of the *os lachrymale*; or, as it is sometimes called, the *os unguis*?

Ans. It is placed at the anterior edge of the inner side of the orbit.

Ques. 150. What is the form of this bone?

Ans. Its external side consists of a flat posterior surface and an anterior groove; its internal surface is exactly the reverse.

Ques. 151. What is situated in its groove ?

Ans. The lachrymal sac.

Ques. 152. What rests upon its flat surface ?

Ans. The ball of the eye rests in part on it.

Ques. 153. What cavities do its inner surfaces cover ?

Ans. The æthmoidal cells.

Ques. 154. What are its connexions ?

Ans. It is joined to the os frontis, os æthmoides, and os maxillare, by the lachrymal sutures.

Ques. 155. What is its fœtal state ?

Ans. It considerably resembles that of the adult.

Ques. 156. What is its use ?

Ans. It forms part of the groove for the lachrymal sac and duct, and also the anterior part of the inner side of the orbit.

Os Malæ.

Ques. 157. What is the situation of the os malæ ?

Ans. It forms the prominence of the cheek.

Ques. 158. What is the general form of this bone ?

Ans. It is irregularly square.

Ques. 159. What are the elevations of the os malæ ?

Ans. They are its maxillary process or inferior angle ; its inferior orbital process, or superior angle of the inner side ; its internal orbital process, projecting inward from its upper part ; its external orbital process, or superior external angle ; and its zygomatic process, or inferior exterior angle.

Ques. 160. What muscles arise from the outside of the zygomatic process ?

Ans. The zygomatic muscles.

Ques. 161. What is attached to the edge of the bone between the zygomatic and superior orbital process ?

Ans. The aponeurosis of the temporal muscle.

Ques. 162. What are its depressions ?

Ans. They are the orbital depression in the orbital process, and the temporal depression behind the zygomatic process.

Ques. 163. What are lodged in these depressions?

Ans. The orbital depression contains part of the ball of the eye, and the temporal depression part of the temporal muscle.

Ques. 164. What are its foramina?

Ans. It has but one foramen, placed below the middle of its upper edge.

Ques. 165. What does this foramen transmit?

Ans. A nervous twig.

Ques. 166. What is the foetal state of this bone?

Ans. It is fully ossified in a foetus at nine months.

Ques. 167. What are its connexions?

Ans. It is connected at its posterior inferior angle to the os temporis, by the zygomatic suture; at its superior orbital process to the os frontis, by the transverse suture; at its internal orbital process to the orbital process of the sphenoid bone, by part of the sphenoidal suture; to the orbital process of the os maxillare, by the internal orbital suture; and at its anterior edge to the same bone, by the external orbital suture.

Ques. 168. What are its uses?

Ans. It forms the prominence of the cheek and part of the orbit, protects the temporal muscles, and gives attachment to its aponeurosis.

Os Maxillare Superius.

Ques. 169. What is the situation of the os maxillare superius?

Ans. It is placed at the anterior inferior part of the upper maxilla.

Ques. 170. What is the general form of this bone?

Ans. It is very irregular.

Ques. 171. What are the elevations of this bone ?

Ans. They are seven in number ; 1st, the alveolar process at its inferior edge ; 2d, the palatine process, projecting backwards and inward from above the alveolar process ; 3d, the spinous process, rising from the inner edge of the palatine ; 4th, the nasal process, ascending from the anterior part of the alveolar ; 5th, the bulbous process, situated behind the nasal ; 6th, the orbital process, which forms the upper part of the bulbous ; and 7th, the malar process, which is placed at its outer side.

Ques. 172. What are contained in the holes of the alveolar process ?

Ans. The teeth.

Ques. 173. What is the use of the palatine process ?

Ans. It forms the floor of the nares, and the arch of the palate.

Ques. 174. What is fixed to the spinous process ?

Ans. The lower edge of the septum narium.

Ques. 175. What rests in the groove on the outer side of the nasal process ?

Ans. It forms with the groove of the lachrymal bone a cavity which contains the lachrymal sac.

Ques. 176. To what muscle does the posterior part of the bulbous process give origin ?

Ans. The pterygoideus externus.

Ques. 177. From what part of the orbital process does the obliquus inferior oculi arise ?

Ans. From the anterior inner edge of the orbital process.

Ques. 178. What are the depressions of the os maxillare superius ?

Ans. They are seven in number ; 1st, the palatine depression on the lower side of the palatine process ; 2d, the nasal depression on its upper side ; 3d, a small depression on the forepart of the alveolar process ; 4th, a more con-

siderable one between the alveolar and malar processes; 5th, the temporal depression placed behind the malar process; 6th, the orbital depression of the orbital process; and 7th, the lachrymal depression on the posterior part of the nasal process.

Ques. 179. What muscle is attached to the small depression on the anterior part of the alveolar process?

Ans. The depressor labii superioris.

Ques. 180. What muscles are attached to the depression between the alveolar and malar processes.

Ans. The levator labiorum communis, and levator labii superioris.

Ques. 181. What is situated in the temporal depression?

Ans. The temporal muscle.

Ques. 182. What are the foramina of this bone?

Ans. They are four in number, two proper and two common; 1st, the infra orbital foramen below the anterior inferior edge of the orbit, being the opening of a canal which passes forward under the orbital process; 2d, the foramen incisivum, placed behind the inner incisor tooth, joining its fellow at the other side inferiorly, but being distinct from it superiorly; 3d, the speno-maxillary fissure at the outer side of the orbit, and the palatine foramen common to this and the palate bone; 4th, the opening of the antrum maxillare between the two turbinated bones.

Ques. 183. What does the infra orbital foramen transmit?

Ans. A branch of the second branch of the fifth pair of nerves, and a branch of the internal maxillary artery.

Ques. 184. What does the foramen incisivum transmit?

Ans. A small artery, vein, and nerve.

Ques. 185. What does the speno-maxillary fissure transmit?

Ans. Twigs of arteries, veins, and nerves.

Ques. 186. What does the palatine foramen transmit?

Ans. The palatine artery and nerve.

Ques. 187. What is the fœtal state of this bone?

Ans. In the fœtal state the bulbous and palatine processes are imperfect, some months before birth the rudiments of the first set of teeth are distinctly formed.

Ques. 188. What are its connexions?

Ans. It is joined by the tip of its nasal process to the os frontis by the transverse suture, by the side of the nasal process to the os unguis by the lachrymal suture, by the anterior edge of the nasal process to the os nasi by the oblique nasal suture, by the malar process to the os malæ by the external orbital sutures, by its orbital process to the os malæ, by the internal orbital suture, by the same process to the æthmoid bone by the æthmoidal suture, by its bulbous process to the os palati by the maxillo palatine suture, by its palatine process to the palate bone by the transverse palatine suture, by its spinous process to the vomer by schindylesis, by the sockets in the alveolar process to the teeth by gomphosis, by its palatine process to its fellow, by the longitudinal palatine suture, above the middle incisor teeth to its fellow by the mystachial suture, and to the inferior turbinated bone by the transverse nasal suture.

Ques. 189. What are its uses?

Ans. It forms a great part of the upper maxilla, composes a part of the orbit, nose, and palate, gives origin to various muscles, and transmission to nerves, arteries, and veins.

Os Palati.

Ques. 190. What is the situation of the os palati?

Ans. It is placed at the posterior part of the orbit, nares, and palate.

Ques. 191. What are its general divisions?

Ans. It is divided into four portions, namely, its palatine, pterygoid, nasal, and orbital processes.

Ques. 192. What is the situation of its palatine process?

Ans. It is placed at the posterior part of the arch of the palate.

Ques. 193. What is the situation of its nasal lamella?

Ans. It is placed posteriorly and externally to the former.

Ques. 194. What is the situation of its pterygoid process?

Ans. It ascends from the outer edge of its palatine portion.

Ques. 195. What is the situation of its orbital processes?

Ans. The posterior one is connected to the base of the sphenoid bone, and the anterior one is placed at the back of the lower side of the orbit.

Ques. 196. What are the elevations of the os palati?

Ans. They are its spinous process, rising from the inner edge of the palatine process; and a transverse ridge on the inside of its nasal portion.

Ques. 197. What is attached to the upper edge of the spinous process?

Ans. Part of the edge of the vomer.

Ques. 198. What is attached to the posterior end of the spinous process?

Ans. The azygos uvulæ.

Ques. 199. What is attached to the posterior semicircular edge of the palatine portion ?

Ans. The velum pendulum palati.

Ques. 200. What is attached to the transverse ridge on the inside of the nasal lamella ?

Ans. The posterior end of the inferior turbinated bone.

Ques. 201. What are the depressions of the os palati ?

Ans. They are one on the upper part of the palatine portion for the nares ; another on its lower part for the palate ; and three upon the posterior part of the pterygoid portion, of which the lateral ones receive the pterygoid processes of the sphenoid bone, and the middle one contributes to form the fossa pterygoidea.

Ques. 202. What are the foramina of the os palati ?

Ans. Besides the foramen properly called palatine, and common to this bone with the superior maxillary, there are several smaller ones which pass upward to join it.

Ques. 203. What is the fœtal state of this bone ?

Ans. In a nine months' fœtus its form is considerably perfect ?

Ques. 204. What are the connexions of the os palati ?

Ans. It is connected by the anterior edge of its palatine portion to the os maxillare superius, by the transverse palatine suture ; by its nasal and anterior orbital process to the same bone, by the maxillo palatine suture ; by its pterygoid process, and the back of its nasal portion to the pterygoid portion of the sphenoid bone, by the sphenoid suture ; by its orbital process to the æthmoid bone, by the æthmoidal suture ; by the transverse ridge of its nasal portion to the inferior turbinated bone, by the transverse nasal suture ; by its orbital process to the body of the sphenoid bone, by the sphenoidal suture ; by the internal edges of its palatine portion to its fellow, by the longitudinal palatine suture ; and by its spinous process to the vomer, by schindylesis.

Ques. 205. What are the uses of the os palati?

Ans. It forms part of the orbits, nares, and palate, and of the sphenoidal, æthmoidal, and maxillary sinuses.

Os Turbinatum Inferius.

Ques. 206. What is the situation of the inferior turbinated bone?

Ans. It is placed on the inner side of the nares.

Ques. 207. What is the form of the inferior turbinated bone?

Ans. It somewhat resembles the superior one, but from its anterior part a small plate ascends to form part of the lachrymal duct, and from its posterior part another descends to cover a part of the antrum Highmorianum.

Ques. 208. What is its fœtal state?

Ans. In the fœtus it considerably resembles its adult state.

Ques. 209. What are its connexions?

Ans. It is joined to the os lachrymale, os maxillare, and os palati, by the transverse nasal suture.

Ques. 210. What is the use of this bone?

Ans. Its use is to give expansion to nerves, and partly to form the antrum and lachrymal duct.

Vomer.

Ques. 211. What is the situation of the vomer?

Ans. It is placed in the middle of the nares, and forms the posterior inferior part of the septums.

Ques. 212. What is the form of the vomer?

Ans. It is irregularly rhomboidal, consisting of two lamellæ which leave a canal along its middle, and its posterior superior part is thickest.

Ques. 213. What is its fœtal state?

Ans. In a fœtus of nine months its lamellæ are separated by cartilage.

Ques. 214. What are its connexions ?

Ans. It is connected by its anterior edge to the cartilage of the septum ; to the spinous processes of the maxillary and palate bones, by schindylesis ; by its upper edge to the nasal lamellæ of the æthmoid, and processus azygos of the sphenoid bone, also by schindylesis.

Ques. 215. What are its uses ?

Ans. Its chief uses are to divide the nares, and permit the expansion of the olfactory nerve.

Os Maxillare Inferius.

Ques. 216. What is the situation of the os maxillare inferius ?

Ans. It is placed at the lower part of the face.

Ques. 217. What are its general divisions ?

Ans. It is divided into the chin, limited by the two anterior foramina ; the sides, extending backward from the foramina ; the angles, in which the sides terminate ; and the rami, which ascend from the angles.

Ques. 218. What are its elevations ?

Ans. They are the condyloid process, which is the posterior of the two arising from each ramus ; the coronoid process, which is the anterior one ; a protuberance on the outer, and another on the inner side of each angle ; a ridge passing externally, and another internally, from the base of the coronoid process to the commencement of the chin ; a protuberance immediately behind the symphysis of the jaw ; and another on each side the base of the chin.

Ques. 219. What is attached to its coronoid processes ?

Ans. The temporal muscles.

Ques. 220. What is attached to the outer sides of its angles ?

Ans. The masseter muscles.

Ques. 221. What is attached to the inner sides of its angles ?

Ans. The internal pterygoid muscles.

Ques. 222. What is attached to the line which passes internally from the base of the coronoid process to the commencement of the chin ?

Ans. The mylo-hoideus muscle.

Ques. 223. What is attached to the line which passes externally from the base of the coronoid process to the commencement of the chin ?

Ans. The buccinator muscle.

Ques. 224. What is attached to the protuberance immediately behind the symphysis of the jaw ?

Ans. The frenum of the tongue superiorly, the genio-hyoidei inferiorly, and the genio-glossi between these.

Ques. 225. What is attached to the projections on the anterior part of the base of the chin ?

Ans. The depressores anguli oris et labii inferioris.

Ques. 226. What are the depressions of the maxilla inferior ?

Ans. There is one depression immediately before each condyloid process ; another on each side of the anterior surface of the chin ; and two on the base of the chin.

Ques. 227. What is fixed to the depression before the condyloid process of the jaw ?

Ans. The pterygoideus externus muscle.

Ques. 228. What is attached to the depressions upon the anterior surface of the chin ?

Ans. The depressores and levatores labii inferiores muscles.

Ques. 229. What is attached to the depressions on the base of the chin ?

Ans. The digastric muscles.

Ques. 230. What are the foramina of the maxilla inferior?

Ans. There are two foramina in this bone on each side; one being placed externally and anteriorly, called the mental foramen, the other internally and posteriorly. They are openings of the same canal.

Ques. 231. What do the foramina of the lower jaw transmit?

Ans. The inferior maxillary artery and vein, and a branch of the third branch of the fifth pair of nerves to the teeth. The mental foramen transmits some of their branches to the chin.

Ques. 232. What passes through the small canal which descends on the inner side of the posterior foramen?

Ans. A nervous twig passes to the sublingual gland and mylo-hyoideus.

Ques. 233. What is the fœtal state of this bone?

Ans. In the fœtal state it is divided in two at the chin by a thin cartilage, hence this part has been called its symphysis, as in the upper jaw the rudiments of the first set of teeth are distinctly formed.

Ques. 234. What are its connexions?

Ans. It is articulated by its condyloid processes to the temporal bone.

Ques. 235. What are its uses?

Ans. It is useful in mastication, deglutition, and speech.

The Teeth.

Ques. 236. What is the number of teeth in the adult?

Ans. Thirty-two.

Ques. 237. What is the situation of the teeth?

Ans. They are fixed in the alveolar process of each jaw.

Ques. 238. Of what substances are the teeth composed?

Ans. They consist of two, one internal of the nature of bone, and the other external and hard, called enamel.

Ques. 239. Upon what part of the teeth is the enamel thickest.

Ans. Upon the tops of the teeth.

Ques. 240. How are the fibres of the enamel arranged?

Ans. They are disposed as radii from the centre of each tooth.

Ques. 241. How are the fibres of the bony part of the teeth arranged?

Ans. They are generally arranged in a perpendicular direction.

Ques. 242. Into what portions is each tooth divided?

Ans. It is divided into a large portion external to the socket, called its corona; into a narrow part below this, called its neck; and one, two, or three processes proceeding from the neck, called the roots.

Ques. 243. Where are the canals of the teeth situated?

Ans. The fangs, neck, and corona of each tooth are hollow.

Ques. 244. What passes through these hollows?

Ans. A branch of an artery, vein, and nerve.

Ques. 245. Into what classes are the teeth divided?

Ans. They are divided into three classes, namely, incisores, canina, and molares.

Ques. 246. What is the number of the incisor teeth?

Ans. Eight; four in the front part of each jaw.

Ques. 247. What is the form of the incisor teeth?

Ans. They somewhat resemble wedges, having a sharp cutting edge.

Ques. 248. Which of the upper incisores are the largest?

Ans. The two middle ones are the largest in the upper jaw.

Ques. 249. Which of the lower incisores are the largest?

Ans. The lateral ones.

Ques. 250. What is the situation of the canini?

Ans. They are placed on each side of the incisores.

Ques. 251. What is their number?

Ans. They are four in number.

Ques. 252. What is their form?

Ans. They are larger and more pointed than the incisores, and resemble the tooth of the dog, from which they take their name.

Ques. 253. What is the situation of the molares?

Ans. They are placed behind the canini.

Ques. 254. What is their number?

Ans. Twenty.

Ques. 255. Which of the molares have been called bicuspides?

Ans. The two anterior on each side of both jaws.

Ques. 256. What is their form?

Ans. They have a double pointed corona, and have one or two fangs.

Ques. 257. Which of the molares have been termed dentes sapientiae?

Ans. The posterior molares, one on each side of both jaws.

Ques. 258. What is their form?

Ans. They have a large irregular corona, and generally but one fang.

Ques. 259. What is the form of the third and fourth molares?

Ans. They have a large corona, and in the lower jaw have two, and in the upper three roots.

Ques. 260. How are the teeth formed?

Ans. The commencement of the formation of teeth is

by small pulpy substances, placed in the alveolar processes of the jaws.

Ques. 261. When are the pulps of the teeth first discernible?

Ans. About the fourth month of the fœtal state.

Ques. 262. What is the appearance of the pulps of the teeth?

Ans. They are firm, semi-transparent, and supplied with numerous vessels.

Ques. 263. How are the pulps of the teeth invested?

Ans. By thin capsules.

Ques. 264. Into what layers are the membranes of the pulps of the teeth divisible?

Ans. They may easily be separated into two layers, of which the external is vascular and spongy.

Ques. 265. What is interposed between the capsule and the pulp of the teeth.

Ans. A small portion of fluid.

Ques. 266. When does ossification commence in the pulps of the teeth?

Ans. About the eighth month.

Ques. 267. In what manner?

Ans. In one or more points.

Ques. 268. To what part of the teeth are their capsules connected?

Ans. To the neck of each tooth.

Ques. 269. What is secreted by the capsules of the teeth?

Ans. The enamel.

Ques. 270. How many teeth compose the first set?

Ans. Twenty.

Ques. 271. Of what kinds does the first set consist?

Ans. Eight incisivi, four canini, and eight molares.

Ques. 272. About what time do the teeth begin to appear through the gums?

Ans. About the age of six months, though sometimes earlier, and are completed at two years old.

Ques. 273. When do the teeth begin to shed?

Ans. About seven years of age.

Ques. 274. When are the teeth completely shed?

Ans. About fourteen years of age this process is generally completed.

Ques. 275. What is the immediate cause of the shedding of the teeth?

Ans. It is effected by the absorption of the fangs of the first set, and of their sockets.

Ques. 276. What are the connexions of the teeth?

Ans. They are articulated to the alveolar processes of the jaws.

Ques. 277. What are their uses?

Ans. They are the direct instruments of mastication, and are of essential use in pronunciation.

Os Hyoides.

Ques. 278. What is the situation of the os hyoides?

Ans. It is placed horizontally between the root of the tongue and the upper part of the larynx.

Ques. 279. Into what parts is it divided?

Ans. Into a body, two cornua, and two appendices.

Ques. 280. What is the form of the body of the os hyoides?

Ans. It is horizontally somewhat oblong, convex anteriorly, and concave posteriorly; its anterior convexity being divided by a middle horizontal ridge.

Ques. 281. What muscles, ligaments, and membranes are attached to the body of the os hyoides?

Ans. The genio-hyoides and the basio-glossi are inserted into the space above the ridge, the mylo-hyoidei and stylo-hyoidei into the ridge itself, and the sterno-hyoidei and coraco-hyoidei into the space below the ridge.

The membranes and ligaments of the tongue, epiglottis, and thyroid cartilage are fixed to its upper edge.

Ques. 282. What is the situation of the cornua of the os hyoides?

Ans. They are placed outward and backward from the body.

Ques. 283. What is the form of the cornua?

Ans. They have two flat sides, which slope from above downwards; they diminish as they proceed backwards, and terminate in round tubercles.

Ques. 284. What muscles, ligaments, and membranes are attached to the cornua of the os hyoides?

Ans. The cerato-glossus arises from the external surface of each cornu, and the hyo-thyroideus from its under edge. The membranes of the tongue and larynx adhere to its posterior side, and from the tubercle at the end of each a ligament proceeds to the cornua of the os hyoides.

Ques. 285. What is the situation of the appendices of the os hyoides?

Ans. They project upwards from the junction of the body with the cornua.

Ques. 286. What is fixed to the appendices?

Ans. The stylo-hyoidei alteri, the condro-glossi, and a ligament to the os hyoides.

Ques. 287. What is the foetal state of this bone?

Ans. Except a point in the middle of its body, it is wholly cartilaginous in the foetal state.

Ques. 288. What are its connexions?

Ans. It is connected to the styloid processes and thyroid cartilage by ligaments.

Ques. 289. What are the uses of this bone?

Ans. It forms a solid point for the insertion and action of the muscles of the organ of speech and deglutition.

[NOTE.—We have now finished the bones of the head; I have endeavoured to make the subject as full and yet as

plain as possible. A student taking this part of the examinations as his guide, and at the same time have the bones before him, cannot fail making himself completely master of the subject.]

SECTION VII.

OF THE BONES OF THE TRUNK.

Ques. 1. Into what parts are the bones of the trunk divided?

Ans. The trunk is divided into the spine, thorax, and pelvis.

Vertebræ.

Ques. 2. What is the situation of the spine?

Ans. It is situated along the posterior part of the trunk.

Ques. 3. What is its general form?

Ans. It resembles a long, slender pyramid, formed of a long chain of bones superiorly, and a short one inferiorly, joined by their bases.

Ques. 4. What is the general division of the spine?

Ans. It is divided into the *vertebræ*, *os sacrum*, and *os coccygis*.

Ques. 5. What is the number of the true *vertebræ*?

Ans. Twenty-four.

Ques. 6. Into what classes are the true vertebræ divided?

Ans. They are subdivided into three classes; namely, those of the neck or cervical, those of the back or dorsal, and those of the loins or lumbar vertebræ.

Ques. 7. Of what parts do the vertebræ in general consist?

Ans. Each vertebræ has a body, a bony ring, and seven processes.

Ques. 8. What is the situation and form of the bodies of the vertebræ?

Ans. They are placed anteriorly, and represent a portion of a cylinder cut transversely, which is somewhat round anteriorly, and sloped posteriorly.

Ques. 9. What are the names of the vertebral processes?

Ans. Four of them are oblique or articular, consisting of two superior and two inferior; three serve the purpose of muscular attachment, of which two, from their situation, are called transverse, and one spinous.

Ques. 10. Where is the ring of the vertebræ situated?

Ans. It is situated immediately behind the body, and within the processes.

Ques. 11. What do the rings of the vertebræ when connected form?

Ans. The vertebral canal.

Ques. 12. Where are the oblique or articular processes of the vertebræ situated?

Ans. The oblique or articular processes are situated above and below the posterior part of the body.

Ques. 13. Where are the transverse processes situated?

Ans. They are situated at the sides of the ring.

Ques. 14. Where are the spinous processes situated?

Ans. They are situated at the back of the ring.

Ques. 15. Where are the notches of the vertebræ situated?

Ans. On each side, between the body and ring, there are four notches, two being situated superiorly, and two inferiorly.

Ques. 16. What is the use of these notches?

Ans. When two vertebræ are joined together, these notches form holes which serve to transmit the intercostal nerves.

Ques. 17. What is the internal structure of the vertebræ?

Ans. They are of a spongy texture.

Ques. 18. How are the vertebræ connected?

Ans. They are connected to each other by their bodies, and by their articular processes.

Cervical Vertebræ.

Ques. 19. What is the peculiar form of the bodies of the cervical vertebræ?

Ans. They are flattened anteriorly, and are thinner than the other vertebræ, their upper sides are concave from side to side, and their lower hollowed from before backward.

Ques. 20. How do the spinous processes of the cervical in general differ from the rest?

Ans. They are more straight, and forked at the extremity.

Ques. 21. How do the transverse processes of the cervical differ from the rest?

Ans. Their transverse processes are very short, slightly bifurcated, and perforated perpendicularly at their bases; they are also grooved in the upper side.

Ques. 22. How do their oblique processes differ from the rest of the vertebræ?

Ans. They are more oblique, their cartilaginous sides in the upper ones being turned backward and upward, in the inferior ones forward and downward.

Atlas.

Ques. 23. What is the name of the first vertebræ?

Ans. It is called the atlas.

Ques. 24. What parts common to the other vertebræ are wanting in the atlas?

Ans. It has no body nor spinous process; it is a simple ring.

Ques. 25. How does the ring of the atlas differ from those of the rest?

Ans. Its ring is much larger.

Ques. 26. What is the name of the anterior and posterior parts of the atlas?

Ans. They are called its anterior and posterior archs.

Ques. 27. To what part of the atlas is the tooth-like process of the second vertebræ fixed?

Ans. To the posterior side of its anterior arch.

Ques. 28. How do the transverse processes of the atlas differ from those of the rest?

Ans. They are longer than those of the rest, and terminate in an obtuse point.

Ques. 29. How do the superior articular processes of the atlas differ from those of the rest?

Ans. They are larger than the rest, and form oblong horizontal cavities, of which the anterior extremities are nearest.

Ques. 30. How do the inferior articular processes differ from those of the rest?

Ans. They are round, broad, and sloped inward.

Ques. 31. What is seen immediately behind the superior articular processes of the atlas?

Ans. A long groove.

Ques. 32. To what part of the atlas is the transverse ligament of the tooth-like process fixed?

Ans. It is fixed to a tuberosity on the inner side of its anterior arch.

Ques. 33. To what part of the atlas are the lateral ligaments fixed?

Ans. They are fixed on the inner side of the arch, external to the transverse ligament.

Dentata.

Ques. 34. What is the name of the second cervical vertebræ?

Ans. It is called vertebra dentata.

Ques. 35. How does the body of the dentata differ from those of the rest?

Ans. Its body is narrower and longer, and has upon its upper part a pivot or axis called odontoides or dens.

Ques. 36. Where is the tooth-like process marked by the situation of its transverse ligament?

Ans. At the posterior part of the processus odontoides.

Ques. 37. From what part of the tooth-like process does the perpendicular ligament arise?

Ans. From its apex.

Ques. 38. From what part of the tooth-like process do the lateral ligaments arise?

Ans. Nearly from its apex, on each side of the perpendicular ligament.

Ques. 39. How does the spinous process of the dentata differ from those of the rest?

Ans. It is short, broad, and much forked; its lower side is hollowed by an angular cavity, and divided into two lateral parts by a bony line.

Ques. 40. How do the transverse processes of this bone differ from the rest?

Ans. They are very short, slightly turned downward, and perforated obliquely.

Ques. 41. How do the superior articular processes of this vertebra differ from those of the rest?

Ans. They are very large, a little convex, placed nearly horizontally on each side of the tooth-like process.

Last Cervical Vertebra.

Ques. 43. How does the body of the last cervical vertebra differ from those of the rest?

Ans. It is the largest of this class; its lower side is nearly flat.

Ques. 44. How does its spinous process differ from the rest?

Ans. It is larger than any of them.

Ques. 45. How does its transverse processes differ?

Ans. They are longer, placed further back, and are less grooved; their foramina also are sometimes double.

Dorsal Vertebrae.

Ques. 46. What is peculiar to the bodies of the dorsal vertebrae in general?

Ans. They are most convex anteriorly, their upper and lower surfaces are nearly flat, and on each side there are two little articular surfaces, one above and one below, to receive the heads of the ribs.

Ques. 47. How do the spinous processes differ from the rest?

Ans. They are long and sharp superiorly; slightly hollowed inferiorly, and considerably inclined downward.

Ques. 48. How do the articular processes differ?

Ans. They are placed almost directly above and below the transverse, and are perpendicular rather than oblique; the sides of the superior ones are slightly convex, and turned backward, those of the inferior the reverse.

Ques. 49. How do the transverse processes differ?

Ans. They are directed obliquely backwards and downwards; they are pretty long superiorly, but diminish as they descend, those of the twelfth being very small; the anterior part of their tips are cartilaginous, and receive the tubercles of the ribs; these depressions diminish as they descend, and do not exist in the two last.

Ques. 50. How do the great foramina of the dorsal vertebræ differ from those of the rest?

Ans. The rings become rounder and narrower as they descend from the first to the tenth, where they again begin to be more flat.

Ques. 51. How are the four first dorsal vertebræ distinguished from the rest of the same class?

Ans. The four first are somewhat flattened anteriorly.

Ques. 52. How are the two last dorsal vertebræ distinguished from the rest of the same class?

Ans. In the last two the transverse processes have no articular depression.

Lumbar Vertebræ.

Ques. 53. How are the bodies of the lumbar vertebræ distinguished from those of the dorsal and cervical?

Ans. They are by much the largest; they are somewhat contracted about the middle, and their edges are prominent.

Ques. 54. How are the spinous processes distinguished from those of the rest?

Ans. They are short, straight, and broad on each side, but narrow above and below; that of the last being shorter and narrower than that of the rest.

Ques. 55. How are the transverse processes distinguished from the rest?

Ans. They are longer and more slender, being flattened

anteriorly and posteriorly ; they increase in length from the first to the third, then diminish to the fifth.

Ques. 56. How are the articular processes distinguished from the rest ?

Ans. The superior ones are concave lengthwise, the inferior convex lengthwise, and nearer each other than the superior, their convex articulating surfaces being turned outward from each other.

Ques. 57. What is the shape of the great foramina of the lumbar vertebræ ?

Ans. The rings are flattened anteriorly, and angular posteriorly.

Os Sacrum.

Ques. 58. What is the situation of the os sacrum ?

Ans. It is placed at the posterior and lower part of the trunk, below the true vertebræ.

Ques. 59. What is its form ?

Ans. It resembles a pyramid with the base upward and apex downward ; having an anterior or concave side, a posterior or convex one, and two edges.

Ques. 60. Of how many portions does the os sacrum consist in the fœtus ?

Ans. Of five ; the points of separation between which are marked by prominent lines in the adult.

Ques. 61. Where is the canal of the os sacrum situated ?

Ans. Immediately behind its body.

Ques. 62. What is its form ?

Ans. It is triangular ?

Ques. 63. How many foramina open from the canal of the sacrum anteriorly ?

Ans. Four.

Ques. 64. How many foramina posteriorly ?

Ans. The same number.

Ques. 65. What do the anterior foramina transmit?

Ans. The great sacral nerves.

Ques. 66. How many articular processes has this bone?

Ans. Two; placed at its base immediately behind its body.

Ques. 67. What is the form of the lateral parts of the sacrum?

Ans. They are large and broad superiorly; they form an uneven narrow surface as they descend?

Ques. 68. What articular surfaces are seen on the lateral parts?

Ans. They have on each side a large articulating surface for its union with the ossa innominata.

Ques. 69. What are the connexions of the os sacrum?

Ans. It is connected laterally to the ossa innominata, superiorly to the last lumbar vertebræ, and inferiorly to the os coccygis.

Os Coccygis.

Ques. 70. What is the situation of the os coccygis?

Ans. It is placed immediately below the sacrum?

Ques. 71. What is its form?

Ans. In its form it considerably resembles the os sacrum.

Ques. 72. Of how many portions does it consist?

Ans. It consists of four or five pieces.

Ques. 73. Where are the shoulders of the os coccygis situated?

Ans. It has two processes; one on each side of its upper portion, which have been called its cornua or shoulders.

Bones of the Thorax.

Ques. 74. By what bones is the thorax formed ?

Ans. It is formed by the dorsal vertebræ posteriorly, the ribs laterally, and sternum anteriorly.

The Ribs.

Ques. 75. What is the situation of the ribs ?

Ans. They are placed transversely and obliquely on each side of the thorax.

Ques. 76. What is the general form of the ribs ?

Ans. They are bony arches of different sizes.

Ques. 77. What is their number ?

Ans. Twenty-four ; twelve on each side.

Ques. 78. Into what classes are the ribs generally divided ?

Ans. Into two classes ; the true and the false ribs.

Ques. 79. What is the number of each class ?

Ans. The seven superior ribs are called true ; the five inferior false.

Ques. 80. Into what parts is each rib divided ?

Ans. Each rib is divided into the middle part or body, an anterior and a posterior extremity, the external or convex, and the internal or concave side, a superior and an inferior edge.

Ques. 81. What is the situation of the head of the ribs ?

Ans. The posterior extremity of the ribs which is turned towards the vertebræ is called the head.

Ques. 82. Where is the neck of the rib ?

Ans. Immediately below the head.

Ques. 83. Where is the tubercle of the rib situated ?

Ans. At a little distance from the head, on the posterior side of the rib.

Ques. 84. Where is the angle of the rib situated ?

Ans. At a little distance from the tubercle the bone forms a sudden bend which is called the angle.

Ques. 85. Which is the rounded edge of the rib ?

Ans. Its superior edge.

Ques. 86. How is the inferior edge of the rib ?

Ans. It is sharp, owing to a groove which runs along its inner side.

Ques. 87. What is situated in this groove ?

Ans. The intercostal artery, vein, and nerve.

Ques. 88. Why is the groove of the inferior edge of the rib most strongly marked in the middle ?

Ans. Because at the head of the rib the vessels have not joined it ; and at its anterior extremity they have separated from it.

Ques. 89. How is the head of the rib marked ?

Ans. The head in general has two cartilaginous surfaces to articulate with the little cavities formed by the union of the dorsal vertebræ with each other.

Ques. 90. How is the tubercle of the rib marked ?

Ans. A cartilaginous surface is seen on each tubercle.

Ques. 91. To what is the tubercle of the rib connected ?

Ans. To the transverse process of the vertebræ above it.

Ques. 92. At what distance is the angle from the tubercle of each rib ?

Ans. In the first rib the angle is not distinct from the tubercle, in the second it is at a small distance, and thence continues to increase to the third false rib.

Ques. 93. What is the form of the anterior end of the ribs ?

Ans. The anterior ends of the true ribs are generally enlarged, those of the inferior false ribs generally diminish,

and both have a small concave depression to receive their cartilaginous elongations.

Ques. 94. Which of the ribs is the longest?

Ans. They increase in length as they descend to the seventh or eighth.

Ques. 95. What is the relative elevation of the ends of the ribs?

Ans. The anterior extremity of each rib is lower than the posterior.

Ques. 96. Whether is the anterior or posterior parts of the ribs most crooked?

Ans. The back part of each rib is most curved.

Ques. 97. Which of the ribs is most contorted?

Ans. The third false rib and those immediately above it.

Ques. 98. How do the anterior extremities of the false ribs differ from those of the true?

Ans. The anterior extremities of the false ribs are considerably the smallest.

Ques. 99. How does the first rib differ from the rest?

Ans. It differs in being placed horizontally, in having its head connected only to one vertebra, having no groove on its under edge, and being directly connected to the sternum.

Ques. 100. How do the eleventh and twelfth ribs differ from the rest?

Ans. They have their heads connected each to one vertebra only, they have no connexion with the transverse processes, and no groove on their inferior edge.

Ques. 101. Which of the ribs have the shortest cartilages?

Ans. The superior ribs.

Ques. 102. Which have the longest cartilages?

Ans. The last true, and the first false rib.

Ques. 163. What is the direction of the cartilages of the ribs?

Ans. They all bend forward, inward, and upward.

Ques. 104. How many of the ribs are directly connected with the sternum?

Ans. The seven true ribs have their cartilages fastened directly to the sternum.

Ques. 105. How many of the ribs are connected by their cartilages merely to the cartilages of others?

Ans. The three superior false ribs.

Ques. 106. How many of the ribs are unconnected by their cartilages either to the sternum or to other cartilages?

Ans. The two inferior false ribs; and on this account have been termed by some floating ribs.

Sternum.

Ques. 107. What is the situation of the sternum?

Ans. The sternum forms the anterior and middle part of the thorax.

Ques. 108. What is its form?

Ans. It somewhat resembles a dagger.

Ques. 109. Of how many portions does it consist?

Ans. It consists of three portions.

Ques. 110. What is the form of its upper portion?

Ans. It is broad and thick superiorly, thinner and narrower below, nearly resembling a triangle with the three angles cut off.

Ques. 111. By what is the superior edge of the upper portion hollowed?

Ans. It is excavated to admit the trachea in the great flexions of the head.

Ques. 112. By what are the superior angles of the sternum depressed?

Ans. It is depressed at those points to receive the clavicles.

Ques. 113. How many depressions are seen on the sides of the upper portion of the sternum?

Ans. Each of the lateral edges have one depression and a half to lodge the anterior extremity of the first, and half of the second ribs.

Ques. 114. What is the form of the second portion of the sternum?

Ans. It is flatter on both sides, and broader below than above.

Ques. 115. What is attached to the outside of the middle portion of the sternum?

Ans. A part of the pectoral muscle.

Ques. 116. What is attached to the innerside of its middle portion?

Ans. The mediastinum and triangularis sterni.

Ques. 117. How many depressions are seen on the sides of the middle portion?

Ans. Five whole and two half depressions.

Ques. 118. How are the depressions of the edges of the middle portion caused?

Ans. They lodge half the anterior extremity of the second; all the third, fourth, fifth, sixth, and half the seventh ribs.

Ques. 119. What is the form of the third portion of the sternum?

Ans. It is somewhat cordiform?

Ques. 120. What depressions are on the sides of the third portions of the sternum?

Ans. At the upper part of each edge there is a half depression for the seventh rib.

Ques. 121. What is the structure of the sternum?

Ans. It is cellular.

Bones of the Pelvis.

Ques. 122. What is the situation of the pelvis ?

Ans. It is situated at the lower part of the trunk.

Ques. 123. What is its form ?

Ans. It represents a kind of basin, of no regular figure.

Ques. 124. Of what bones does the pelvis consist ?

Ans. It is formed by the os sacrum posteriorly, os coccygis inferiorly, and ossa innominata at its lateral and anterior parts.

Ques. 125. How are the ossa innominata subdivided ?

Ans. Each os innominata is subdivided into three portions ; namely, the os ilium, os pubis, and os ischium ; these are considered as separate bones, on account of their being easily separable in young subjects.

Os Ilium.

Ques. 126. What is the situation of the os ilium ?

Ans. It forms the broad expanded superior part of the os innominatum.

Ques. 127. What is its general form ?

Ans. It is of a triangular figure ; its broad flat sides are unequally convex and concave.

Ques. 128. Into what parts is it divided ?

Ans. It is divided into the crista ; basis ; anterior and posterior, and external and internal sides.

Ques. 129. Where is the crista situated ?

Ans. It forms the upper thick edge of the os ileum.

Ques. 130. What are the edges of the crista of the ileum called ?

Ans. Its external and internal labium.

Ques. 131. What are its anterior and posterior extremities called ?

Ans. They are called its anterior superior, and posterior superior spinous processes.

Ques. 132. What is attached to the anterior superior spinous process ?

Ans. Poupart's ligament and the Sartorius muscle.

Ques. 133. Where are the anterior inferior, and posterior inferior spinous processes situated ?

Ans. About an inch below the anterior, and at the same distance below the posterior superior processes.

Ques. 134. What parts of the ilium are thickest ?

Ans. Its basis, or inferior portion.

Ques. 135. To form what notch does the ilium posteriorly contribute ?

Ans. The great sacro-ischiatic notch.

Ques. 136. To form what cavity does the outside of the base of the ilium contribute ?

Ans. It forms part of the acetabulum, or great articular cavity of the os innominatum, called so from its resemblance to the vinegar cup of the ancients.

Ques. 137. How much does the ilium contribute to the acetabulum ?

Ans. Somewhat less than two-fifths.

Ques. 138. What muscles are attached to the outer labium of this bone ?

Ans. The aponeurosis fascia lata, the latissimus dorsi and external oblique muscle of the abdomen, and posteriorly the gluteus maximus.

Ques. 139. What muscles are attached to the line extending on the dorsum of the ilium from its anterior superior spinous process to the sciatic notch ?

Ans. The gluteus medius.

Ques. 140. What muscle is attached to the semicircular ridge immediately above the acetabulum ?

Ans. The gluteus minimus.

Ques. 141. What muscle is situated in the hollow of the inner side of the ileum ?

Ans. The iliacus internus.

Ques. 142. What is the appearance of the posterior part of the inner side of this bone ?

Ans. There are found two articular surfaces corresponding to those of the sacrum.

Ques. 143. What part of the ilium distinguishes the cavity of the pelvis from that of the abdomen ?

Ans. A smooth ridge which traverses the inner side of the base of this bone.

Os Ischium.

Ques. 144. What is the situation of the os ischium ?

Ans. It is situated at the lowest part of the os innominatum.

Ques. 145. Into what parts is it divided ?

Ans. Into a body, a tuberosity, and a ramus.

Ques. 146. Where is the spine of the ischium ?

Ans. Upon the posterior part of its body is found its spinous process.

Ques. 147. What is attached to its spinous process ?

Ans. The lesser sacro-ischiatic ligament, and the coccygeus internally.

Ques. 148. Where is the tuberosity of the ischium ?

Ans. It is situated at the lower and posterior part of its body, where the ramus joins it ; it is that part of the bone upon which we rest in sitting.

Ques. 149. What muscles arise from the tuberosity of the ischium ?

Ans. The quadratus femoris externally ; the semimembranosis, semitendinosus, and biceps, about its middle part ; the great head of the triceps from its inferior part ; the great sacro-ischiatic ligament is also attached to its inner part.

Ques. 150. What is the situation of its ramus ?

Ans. It ascends forwards from the tuberosity.

Ques. 151. What are the notches of the os ischium ?

Ans. By a very considerable notch anteriorly it contributes to form the obturator foramen ; a notch posteriorly between the tuberosity and the spine for the obturator muscle ; one laterally between the tuberosity and acetabulum for the obturator externus ; and one anteriorly at the edge of the acetabulum for ligaments ; vessels and fat are also noticed.

Os Pubis.

Ques. 152. What is the situation of the os pubis ?

Ans. It is situated at the anterior part of the pelvis.

Ques. 153. Into what parts is the os pubis divided ?

Ans. It is divided into a body, angle, and branch.

Ques. 154. What is the situation of the body of the os pubis ?

Ans. It forms its upper part ; situated before the base of the os ilium.

Ques. 155. How much does the os pubis contribute to form the acetabulum ?

Ans. One-fifth.

Ques. 156. Where does the os pubis mark the limits of the pelvis ?

Ans. A line on the inner side of its body forms part of the brim of the pelvis.

Ques. 157. Where is the spine of the os pubis ?

Ans. It is situated about an inch from the angle.

Ques. 158. What does its spine give attachment to ?

Ans. It gives attachment to Poupart's ligament, and in part to the rectus and pyramidalis abdominis.

Ques. 159. To what foramen does the os pubis contribute ?

Ans. The obturator foramen.

Ques. 160. Where is the angle of the os pubis ?

Ans. It is situated anteriorly ; formed by the junction of the body and ramus.

Ques. 161. Where is its ramus ?

Ans. It descends from its angle.

Acetabulum.

Ques. 162. How is the acetabulum formed ?

Ans. One-fifth of the acetabulum is formed by the os pubis, rather more than two-fifths by the os ischium, and less than two-fifths by the os ilium.

Ques. 163. What part of the edge of the acetabulum is most prominent ?

Ans. The upper part of its brim.

Ques. 164. What portion of the acetabulum is without cartilage ?

Ans. Between its middle and its inferior notch.

Ques. 165. What is situated in that portion of the acetabulum which is uncovered by cartilage ?

Ans. A ligament and synovial glands.

Ques. 166. Where is the notch of the acetabulum situated ?

Ans. Towards its lower part.

Ques. 167. What is the use of this notch ?

Ans. It transmits certain vessels, &c.

Ques. 168. What are the connexions of the os innominatum ?

Ans. It is connected posteriorly to the os sacrum ; anteriorly to its fellow, forming the symphysis pubis ; and laterally and inferiorly to the thigh bone.

SECTION VIII.

OF THE BONES OF THE UPPER EXTREMITIES.

Ques. 1. How are the bones of the upper extremity divided?

Ans. The bones of the upper extremity are divided into four classes; namely, those of the shoulder, the arm, the fore arm, and the hand.

Bones of the Shoulder.

Ques. 2. Of how many bones does the shoulder consist?

Ans. Of two; the scapula and clavicle.

Scapula.

Ques. 3. What is the situation of the scapula?

Ans. It is placed laterally at the upper and posterior part of the thorax from about the first to the seventh rib.

Ques. 4. What is its general form?

Ans. It is somewhat triangular.

Ques. 5. What parts of the scapula are generally enumerated?

Ans. Its regions are an external or posterior and convex side; an internal or anterior concave side, three edges of which one is named the basis and two costa; a superior and an inferior; three angles, one anterior called the neck, one superior, and one inferior.

Ques. 6. What is the situation of the base of the scapula?

Ans. The base is the longest and thinnest edge turned towards the spine; its upper part being nearer the vertebræ than the lower.

Ques. 7. What is the situation of the superior costa?

Ans. It is situated almost transversely between the superior point of the base and the neck of the scapula; being most raised toward the base.

Ques. 8. Where is the notch of the scapula?

Ans. At the anterior part of the superior costa.

Ques. 9. What passes through this notch?

Ans. The supra scapular vessels and nerves.

Ques. 10. What is the situation of the inferior costa?

Ans. It is situated obliquely between the inferior point of the base and the neck of the scapula.

Ques. 11. Which edge of the scapula is the thickest?

Ans. Its inferior edge or costa.

Ques. 12. Where is the neck of the scapula?

Ans. It forms the anterior angle.

Ques. 13. How is the neck of the scapula terminated?

Ans. By a glenoid cavity.

Ques. 14. What process proceeds from the neck of the scapula?

Ans. The coracoid process.

Ques. 15. What is attached to the tuberosity of the coracoid process?

Ans. The coraco-clavicular and coraco-acromial ligaments.

Ques. 16. What muscles arise from the tip of the coracoid process?

Ans. Three; namely, the pectoralis minor internally; the coraco-brachialis; and the short head of the biceps.

Ques. 17. What muscle arises from above the glenoid cavity?

Ans. The long head of the biceps.

Ques. 18. What is the appearance of the dorsum of the scapula?

Ans. It is unequally convex.

Ques. 19. What process arises from the dorsum of the scapula?

Ans. The spine of the scapula, which divides the dorsum of the scapula into two portions.

Ques. 20. What muscle is attached to the superior side of the spine of the scapula?

Ans. The trapezius.

Ques. 21. What muscle arises from the inferior edge of its spine?

Ans. The deltoid.

Ques. 22. In what process does the spine of the scapula terminate?

Ans. The acromion process.

Ques. 23. What is the form of the acromion?

Ans. It is broad and flat.

Ques. 24. What is attached to the upper edge of the acromion near its apex?

Ans. The scapular end of the clavicle.

Ques. 25. What muscle arises from the inferior and anterior edges of the acromion?

Ans. The deltoid.

Ques. 26. Into what cavities does the spine divide the dorsum of the scapula?

Ans. Into the supra-spinal and infra-spinal fossæ.

Ques. 27. Whether is the supra-spinal or infra-spinal largest?

Ans. The infra-spinal is the largest.

Ques. 28. What is situated in the supra-spinal fossa?

Ans. The supra-spinatus muscle.

Ques. 29. What is situated in the infra-spinal fossa?

Ans. The infra-spinatus muscle.

Ques. 30. What arises from the groove, below the infra-spinal fossa, on the inferior costa of the scapula?

Ans. The *teres minor*.

Ques. 31. What muscle arises from the flat surface on the outside of the inferior angle of the scapula?

Ans. The *teres major*.

Ques. 32. What muscle passes over the inferior angle of this bone?

Ans. The *latissimus dorsi*.

Ques. 33. What is the appearance of the inner side of the scapula?

Ans. It is irregularly concave.

Ques. 34. What muscle is situated on the inner side of the scapula?

Ans. The *subscapularis*.

Ques. 35. What is the general structure of the scapula?

Ans. The thicker parts of the bone possess a diploe; the thin parts have none, and are transparent.

Ques. 36. What are the connexions of the scapula?

Ans. It is connected to the clavicle by the *acromion*, and to the *os humeri* by its *glenoid cavity*.

Clavicle.

Ques. 37. What is the situation of the clavicle?

Ans. It is placed transversely and somewhat obliquely at the upper and anterior part of the thorax, between the scapula and sternum.

Ques. 38. What is its general form?

Ans. It has a considerable resemblance to an italic *f*.

Ques. 39. Into what parts is it divided?

Ans. It is divided into a body, and an internal or sternal and an external or scapular extremity.

Ques. 40. What is the form of the sternal end of the clavicle?

Ans. It is somewhat triangular.

Ques. 41. What is attached to the posterior angle of the sternal end ?

Ans. The inter-clavicular ligament.

Ques. 42. With what is the tubercle at the posterior part near the humeral end connected ?

Ans. It is connected by a strong ligament to the coracoid process of the scapula.

Ques. 43. What is the form of the scapular end of the clavicle ?

Ans. It is flat and broad.

Ques. 44. What muscle arises from the anterior edge of the scapular end of this bone ?

Ans. The deltoid.

Ques. 45. What muscle is inserted into the posterior edge of the scapular end ?

Ans. The trapezius.

Ques. 46. What muscle arises from the anterior edge of the inner half of the clavicle ?

Ans. The pectoralis major.

Ques. 47. What muscle is inserted into the inferior side of the clavicle ?

Ans. The subclavius.

Ques. 48. What is the structure of the clavicle ?

Ans. The extremities are cellular ; while its middle, having thick sides, possesses a narrow cavity, filled with bony filaments.

Ques. 49. What are the connexions of the clavicle ?

Ans. It is connected internally to the first bone of the sternum, and externally to the acromion.

Os Humeri.

Ques. 50. What is the situation of the os humeri ?

Ans. It is placed under the acromion, along the side of the thorax.

Ques. 51. What is its general form ?

Ans. It is irregularly cylindrical.

Ques. 52. Into what parts is it divided ?

Ans. Into a body, and a superior and inferior extremity.

Ques. 53. What is the form and direction of the head of the os humeri ?

Ans. It is formed by a round, smooth head, and inclines obliquely inward.

Ques. 54. Where are the tuberosities of the humerus situated ?

Ans. Externally, and somewhat inferiorly, to the head of the bone.

Ques. 55. How are these tuberosities distinguished ?

Ans. One is called the internal or small, the other the external or great tuberosity.

Ques. 56. What muscle is inserted into the internal tuberosity ?

Ans. The subscapularis.

Ques. 57. What muscles are inserted into the great tuberosity ?

Ans. The supra-spinatus, infra-spinatus, and teres minor.

Ques. 58. What is situated between these tuberosities ?

Ans. A very considerable groove.

Ques. 59. What passes through this groove ?

Ans. The tendon of the long head of the biceps.

Ques. 60. What is called the neck of the humerus ?

Ans. The slight circular depression immediately below its head.

Ques. 61. What arises from the posterior part of the neck ?

Ans. The internal head of the triceps.

Ques. 62. What is inserted into the ridge external to the groove ?

Ans. The pectoralis major muscle.

Ques. 63. What is inserted into the ridge internal to the groove ?

Ans. The latissimus dorsi and teres major muscles ?

Ques. 64. What is inserted into the great muscular depression on the outer side of the middle of the os humeri ?

Ans. The deltoid muscle.

Ques. 65. What is inserted into the ridge on the inner side of the middle of the os humeri ?

Ans. The coraco-brachialis.

Ques. 66. At what part, and in what direction, does the medullary artery of this bone enter ?

Ans. It enters about the middle of the anterior side of the bone, and slants downward.

Ques. 67. What is the form of the lower part of the os humeri ?

Ans. The lower extremity becomes gradually flatter and broader than the rest of this bone ; having an outer and an inner edge which terminate in two processes.

Ques. 68. What are the names of these two processes ?

Ans. The outer and inner condyles.

Ques. 69. Which of the condyles is the largest ?

Ans. The inner one is the largest and most projecting.

Ques. 70. What muscles generally arise from the external condyle ?

Ans. The two extensors and supinators of the hands.

Ques. 71. What muscles arise from the internal condyle ?

Ans. The flexors and pronators of the hands.

Ques. 72. Where is the trochlea of the os humeri situated ?

Ans. Between and somewhat below the two condyles.

Ques. 73. What is the form of the trochlea ?

Ans. It is an oblique, pulley-like articular surface ; its inner edge is the most prominent ; a small round articular head is placed between it and the outer condyle.

Ques. 74. What is the form of the os humeri immediately above the trochlea?

Ans. Above these parts there are two slight depressions anteriorly, and a very considerable one posteriorly.

Ques. 75. To what are the depressions above the trochlea adapted?

Ans. The posterior one receives the olecranon when the arm is extended; the inner anterior one receives the coronoid process of the ulna; and the outer anterior one receives the round head of the radius in the flexions of the forearm.

Ques. 76. What is the particular situation of the os humeri?

Ans. In its natural situation the hemispherical head of this bone is turned inwards and backwards; the great tuberosity outward and forward; the groove between the two tuberosities directly forward; the external condyle forward and outward; and the internal condyle backward and inward.

Ques. 77. What is the structure of the os humeri?

Ans. The extremities are cellular; but the middle has a tubular cavity, and several bony filaments passing across it.

Ques. 78. What are the connexions of the os humeri?

Ans. It is connected superiorly with the glenoid cavity of the scapula; and inferiorly with the ulna by its trochlea; and with the radius by its little round head.

Bones of the Forearm.

Ques. 79. Of how many bones does the forearm consist?

Ans. The forearm consists of two bones; namely, the ulna and radius.

Ques. 80. What is the situation of the ulna?

Ans. It is situated on the inner side of the forearm.

Ques. 81. What is its form ?

Ans. It is a cylindrical bone, and in its circumference irregularly triangular.

Ques. 82. How is it divided ?

Ans. Into a body and two extremities.

Ques. 83. What are its chief eminences ?

Ans. The olecranon and coronoid processes.

Ques. 84. What is the situation of the olecranon ?

Ans. It forms the upper extremity of this bone.

Ques. 85. What muscle is inserted into it ?

Ans. The triceps extensor cubiti.

Ques. 86. Where is the coronoid process ?

Ans. It is situated on the anterior part of the bone somewhat lower than the olecranon.

Ques. 87. What muscle is inserted into it ?

Ans. The brachialis internus.

Ques. 88. Where is the olecranon lodged when the forearm is extended ?

Ans. It is lodged in the posterior depression of the inferior end of the humerus.

Ques. 89. Where is the coronoid process lodged during the flexion of the forearm ?

Ans. It is lodged in the anterior and inner depression of the lower end of the humerus.

Ques. 90. What is the use of the triangular surface on the posterior part of the olecranon ?

Ans. It forms the part of the elbow on which we rest.

Ques. 91. What is lodged in the fossa external to the triangular surface ?

Ans. The anconeus muscle.

Ques. 92. Where is the greater sigmoid cavity of the ulna ?

Ans. It is in the articular surface formed between the olecranon and coronoid processes.

Ques. 93. What is its use ?

Ans. It articulates with the trochlea of the os humeri.

Ques. 94. Where is the lesser sigmoid cavity ?

Ans. It is situated on the outside of the root of the coronoid process.

Ques. 95. What is its use ?

Ans. It receives the round head of the radius.

Ques. 96. What is the form of the body of the ulna ?

Ans. It is triangular.

Ques. 97. What is attached to the outer sharp edge of the ulna ?

Ans. The interosseous ligament.

Ques. 98. What is the situation of the canal for the medullary artery of the ulna ?

Ans. It is placed about the middle of the anterior part of the bone, and slants upward.

Ques. 99. What is the form of the inferior extremity of the ulna ?

Ans. It has a small head externally, and a styloid process internally.

Ques. 100. What is attached to the styloid process ?

Ans. A ligament from the os pisiforme.

Ques. 101. What passes in the groove on the anterior side of the termination of the ulna ?

Ans. The ulna artery and nerve.

Ques. 102. What passes in the groove on the posterior side of its termination ?

Ans. The tendon of the extensor carpi ulnaris.

Ques. 103. What is the structure of the ulna ?

Ans. Its structure resembles that of the os humeri.

Ques. 104. What are the connexions of the ulna ?

Ans. It is connected superiorly with the pulley of the os humeri ; laterally with the two extremities of the radius, and with the hand inferiorly.

Radius.

Ques. 105. What is the situation of the radius ?

Ans. It is placed on the outer side of the forearm.

Ques. 106. What is its form ?

Ans. It is a cylindrical bone irregularly triangular.

Ques. 107. What are the relative lengths of the radius and ulna ?

Ans. The radius is the shortest.

Ques. 108. How is the radius divided ?

Ans. Into a head, body, and basis.

Ques. 109. What is the form of the head ?

Ans. The upper part of the head is concave for connexion with the small round head of the humerus ; and its circumference is cylindrical.

Ques. 110. With what is the head of the radius articulated laterally ?

Ans. With the lesser sigmoid cavity of the ulna.

Ques. 111. What is the situation and direction of the neck of the radius ?

Ans. It is situated immediately below the head, and its direction is somewhat oblique.

Ques. 112. Where is the tuberosity of the radius situated ?

Ans. On the inner and anterior side, immediately below the neck.

Ques. 113. What is attached to the tuberosity of the radius ?

Ans. The biceps flexor cubiti.

Ques. 114. What is the form of the body of the radius ?

Ans. It is somewhat triangular.

Ques. 115. What is attached to the inner sharp edge of the radius ?

Ans. The interosseous ligament.

Ques. 116. What is the situation and direction of the canal of the medullary artery of the radius ?

Ans. It enters about the middle of the anterior side of the bone, and slants upward.

Ques. 117. What is the relative size of the two ends of the radius ?

Ans. The inferior extremity is the largest.

Ques. 118. What is the form of its inferior extremity ?

Ans. Its greatest diameter is from side to side.

Ques. 119. For what purpose is the anterior side of the inferior end of the radius hollowed ?

Ans. It is hollowed for the passage of the flexor tendons.

Ques. 120. What is received into the depression on the inner side of the radius ?

Ans. The inferior head of the ulna.

Ques. 121. What pass in the grooves on the posterior side ?

Ans. The extensor tendons.

Ques. 122. What is the situation of the styloid process of the radius.

Ans. It is placed on the inferior end of its outer side.

Ques. 123. What is attached to the styloid process ?

Ans. A ligament connecting it to the trapezium.

Ques. 124. What is the structure of the radius ?

Ans. It resembles that of the other long bones.

Ques. 125. What are its connexions ?

Ans. It is joined superiorly to the os humeri, laterally to both ends of the ulna, and inferiorly to the bones of the carpus.

Bones of the Hand.

Ques. 126. How are the bones of the hand classed ?

Ans. They are divided into the carpus, metacarpus, and phalanges.

Carpus.

Ques. 127. What is the situation of the carpus ?

Ans. It forms the wrist and the base of the hand.

Ques. 128. Of how many bones is it composed ?

Ans. It consists of eight bones.

Ques. 129. What is its general form ?

Ans. It is convex externally and concave internally, and is of an irregular quadrangular form.

Ques. 130. How are the bones of the carpus arranged ?

Ans. They are arranged in two rows ; an upper and a lower row ; four bones in each row.

Ques. 131. What are the names of the carpal bones ?

Ans. Those of the upper row are the os scaphoides, os lunare, os cuneiform, os pisiforme : those of the lower row are the os trapezium, os trapezoides, os magnum, and os unciforme.

Ques. 132. What is the situation of the os scaphoides ?

Ans. It is the first or most external bone of the first row.

Ques. 133. What is the general form of the os scaphoides ?

Ans. Its superior side is convex ; its inferior side concave ; and the whole bone is oblong, bearing, as its name implies, some resemblance to a boat.

Ques. 134. What is the situation of the os lunare ?

Ans. The os lunare is the second bone of the first row.

Ques. 135. What is its form ?

Ans. It is convex superiorly ; concave inferiorly. Its anterior and posterior surfaces are rough for the attachment of ligaments.

Ques. 136. What is the situation of the os cuneiforme ?

Ans. It is the third bone of the first row.

Ques. 137. What is its general form ?

Ans. Its upper surface is convex ; its anterior surface has upon it an orbicular plane for the os pisiforme ; it has also articular surfaces towards the os lunare and the os unciforme.

Ques. 138. What is the situation of the os pisiforme ?

Ans. It is the fourth bone of the first row placed upon the anterior side of the cuneiforme.

Ques. 139. What is its form ?

Ans. It is irregularly round.

Ques. 140. What is the situation of the os trapezium ?

Ans. It is the first or external bone of the second row.

Ques. 141. What is the form of it ?

Ans. It is irregularly square ; its inner surface has upon it an oblong eminence for the carpal ligament, and a groove for the tendon of the flexor longus pollicis ; its upper side is hollow for articulation with the os scaphoides ; its lower side is connected with the first bone of the thumb ; its outer surface is rough ; and its inner side is connected superiorly with the os trapezoides ; and inferiorly with the first bone of the metacarpus.

Ques. 142. What is the situation and form of the os trapezoides ?

Ans. It is the second bone of the second row ; it is joined superiorly to the os scaphoides ; inferiorly to the base of the first metacarpal bone ; on its radial side to the os trapezium ; and on its ulna side to the os magnum.

Ques. 143. What is the situation and form of the os magnum ?

Ans. It is the third bone of the second row ; its superior side is round for connexion with the os scaphoides and os lunare ; inferiorly it is joined to the second metacarpal bone ; on its radial side to the os trapezoides ; and on its ulna side to the os unciforme.

Ques. 144. What is the situation of the os unciforme ?

Ans. It is the fourth bone of the second row.

Ques. 145. What is its general form ?

Ans. Its anterior surface has upon it a hook-like process, from which the carpal ligament and some muscles of the little finger arise ; its posterior surface is rough for the attachment of ligaments ; its radial side is double, corresponding to the ulnar side of the os magnum ; its superior side corresponds to the inferior one of the os cuneiforme ; its inferior side is double for the last bones of the metacarpus.

Ques. 146. What is the structure of the carpal bones ?

Ans. The structure of these bones are spongy.

Metacarpus.

Ques. 147. What is the situation of the metacarpus ?

Ans. The metacarpus is placed immediately below the carpus.

Ques. 148. Of how many bones does the metacarpus consist ?

Ans. It consists of four bones, one supporting each finger ; some anatomists reckon five, considering the first bone of the thumb as a metacarpal bone.

Ques. 149. What is the general form of the metacarpal bones ?

Ans. They are long bones ; thicker at the extremities than at the middle.

Ques. 150. Into what parts are they divided ?

Ans. They may be divided into a basis, body, and head.

Ques. 151. What is the form of the basis of the metacarpal bones ?

Ans. They are narrow toward the palm, broader towards the back of the hand, and broadest on each side.

Ques. 152. What is the form of their bodies ?

Ans. They are contracted, of a triangular figure ; posteriorly somewhat convex for the back of the hand, and anteriorly each has a sharp ridge.

Ques. 153. What is the form of their heads ?

Ans. They are round eminences flattened on each side ; their greatest convexity is turned towards the palm.

Ques. 154. Which is the largest of the metacarpal bones ?

Ans. The first, which supports the forefinger, is the longest.

Ques. 155. What is their structure ?

Ans. They resemble the long bones.

Ques. 156. What are their connexions ?

Ans. They are connected superiorly to the bones of the carpus ; laterally to each other by their bases ; and inferiorly to the first bones of the fingers.

Bones of the Fingers.

Ques. 157. How many bones compose the fingers ?

Ans. Each finger is composed of three bones ; there are fifteen in the whole, including those of the thumb.

Ques. 158. How are the bones of the fingers named ?

Ans. They are called phalanges ; those nearest the metacarpal bones are called the first, and those which form the ends of the fingers the third or last.

Ques. 159. What is the form of the first bone of the thumb ?

Ans. The first bone of the thumb considerably resembles the bones of the metacarpus ; its convex side is much

flattened, and is broadest towards the head, which resembles the metacarpal bones ; the articular surface of its base is a double ginglymus, allowing flexion and extension, adduction and abduction, and corresponds to the lower side of the os trapezium.

Ques. 160. What is the form of the second bone of the thumb ?

Ans. It is shorter than the first, convex on one side, flat on the other, and contracted between the edges.

Ques. 161. What is the form of the third bone of the thumb ?

Ans. The base of the third bone of the thumb forms a ginglymus with the head of the second bone ; and has very near it, on each side, a small tuberosity : its head is small and flat, and ending in a rough semicircular edge.

Ques. 162. What is the form of the first phalanges of the fingers ?

Ans. They somewhat resemble the second bone of the thumb : but they are longer, flatter anteriorly, and rounder posteriorly.

Ques. 163. What is the form of the second phalanges of the fingers ?

Ans. They are shorter, narrower, and thinner than those of the first : their bases have a double cavity for a ginglymoid articulation.

Ques. 164. What is the form of the third phalanges ?

Ans. They exactly resemble that of the thumb, except that their size is proportioned to their respective fingers.

SECTION IX.

OF THE BONES OF THE LOWER EXTREMITIES.

Ques. 1. How are the bones of the lower extremities divided ?

Ans. Each lower extremity is divided into the thigh, leg, and foot.

Os Femoris.

Ques. 2. What is the situation of the os femoris ?

Ans. It is placed nearly in the same direction with the trunk, only bends somewhat inward.

Ques. 3. Into what parts is it divided ?

Ans. Into a body, a superior and inferior extremity.

Ques. 4. What is the form of the head of the os femoris ?

Ans. It resembles a large portion of a ball, supported by its long neck.

Ques. 5. In what direction is the head of the os femoris placed ?

Ans. It is turned obliquely inward and a little forward; forming an angle with the body.

Ques. 6. Where is the fossa of the head of this bone ?

Ans. A little below its centre.

Ques. 7. What is attached to the edge of this fossa ?

Ans. A strong ligament, called the ligamentum teres.

Ques. 8. What is the situation of the neck of this bone ?

Ans. It is placed at the upper part of the bone.

Ques. 9. What is the direction of its neck ?

Ans. It is inclined upward and slightly forward, supporting the head.

Ques. 10. Where is the capsular ligament inserted ?

Ans. Around the root of the neck.

Ques. 11. What is the name of the great tuberosities situated at the root of the neck of the os femoris ?

Ans. The trochanter major is the name given to the greater tuberosity.

Ques. 12. At what particular part of the base of the neck is the trochanter major situated ?

Ans. It is situated at its outer side.

Ques. 13. What covers the external convex surface of the trochanter major ?

Ans. It is covered by the tendon of the gluteus maximus.

Ques. 14. What muscle is attached to the rough broad anterior muscular mark on the great trochanter ?

Ans. The gluteus minimus ?

Ques. 15. What is fixed to the posterior edge of the great trochanter ?

Ans. The quadratus femoris.

Ques. 16. What is attached to the sharp superior edge of the great trochanter ?

Ans. The gluteus medius posteriorly ; and the pyramiformis, obturator internus, and gemini, anteriorly.

Ques. 17. What is attached to its deep fossa ?

Ans. The tendon of the obturator externus.

Ques. 18. What is the form of the body of the os femoris ?

Ans. It is cylindrical.

Ques. 19. Where is the trochanter minor situated ?

Ans. At the inner and posterior part of the root of the neck.

Ques. 20. What is attached to the trochanter minor ?

Ans. The iliacus internus and psoas muscles.

Ques. 21. Where is the linea aspera ?

Ans. It is the rough prominent line passing along the posterior part of the os femoris.

Ques. 22. What muscle is fixed to the commencement of the linea aspera ?

Ans. The gluteus maximus.

Ques. 23. What muscles are attached to its middle ?

Ans. The triceps is inserted into its middle, and the short head of the biceps arises from it.

Ques. 24. How does the linea aspera terminate inferiorly ?

Ans. It divides into two ridges ; one of which passes externally and the other internally.

Ques. 25. What is attached to the outer ridge ?

Ans. The vastus externus.

Ques. 26. What is attached to the inner ridge ?

Ans. The vastus internus, and the aponeurosis of the great head of the triceps.

Ques. 27. Over which of the ridges do the femoral vessels pass ?

Ans. Over the internal one.

Ques. 28. What is inserted into the tuberosity which terminates the inner ridge of the linea aspera ?

Ans. The tendon of the great head of the triceps.

Ques. 29. What is the situation and direction of the canal of the medullary artery ?

Ans. It is placed about the middle of the linea aspera, and slants upwards.

Ques. 30. What is the form of the lower extremity of the os femoris ?

Ans. It is broad and thick ; formed by two large protuberances projecting downward and backward.

Ques. 31. What is the name of these protuberances ?

Ans. The condyles of the os femoris.

Ques. 32. Which of the condyles projects most inferiorly and posteriorly ?

Ans. The inner condyle.

Ques. 33. Which of the condyles projects most anteriorly ?

Ans. The outer condyle.

Ques. 34. What is situated between the two condyles posteriorly ?

Ans. A deep notch which separates them.

Ques. 35. What is transmitted through this notch ?

Ans. The vessels pass from the thigh through this notch.

Ques. 36. What ligaments are attached to the inner side of this notch ?

Ans. The crucial ligaments.

Ques. 37. Where is the pulley of the os femoris situated ?

Ans. The junction of the condyles anteriorly forms a pulley-like surface on which the patella rests.

Ques. 38. What are attached to the small tuberosities immediately above the back of the condyles ?

Ans. The heads of the gastrocnemius.

Ques. 39. What is the structure of the os femoris ?

Ans. Its structure resembles that of the other long bones.

Ques. 40. What are the connexions of the os femoris ?

Ans. It is connected to the os innominatum superiorly, and to the tibia inferiorly.

Bones of the Leg.

Ques. 41. Of what bones does the leg consist ?

Ans. It consists of three bones ; namely, the tibia, fibula, and patella.

Tibia.

Ques. 42. How is the tibia situated?

Ans. It is placed on the inner side of the leg.

Ques. 43. What is its general form?

Ans. Its circumference is irregularly triangular; it is larger above than below.

Ques. 44. How is it divided?

Ans. Into a body; an upper and a lower extremity.

Ques. 45. What is the form of the superior articular surfaces of this bone?

Ans. Its thick expanded superior extremity, which has been called its head, presents two broad articular surfaces; one placed externally, the other internally, nearly horizontal and slightly hollowed.

Ques. 46. What difference is there in the form of the superior articular surfaces of the tibia?

Ans. The internal one is somewhat oblong and depressed; the external one is rounder.

Ques. 47. What is attached to the tuberosity between the superior articular surfaces?

Ans. The crucial ligaments.

Ques. 48. What is inserted into the tuberosity behind the inner part of the head of the tibia?

Ans. The semimembranosus muscle.

Ques. 49. What is fixed to the tuberosity behind the outer part of the head of the tibia?

Ans. The head of the fibula.

Ques. 50. What is attached to the tuberosity on the fore part of this bone?

Ans. The ligament of the patella.

Ques. 51. What is the form of the body of the tibia?

Ans. It presents three distinct surfaces and edges?

Ques. 52. What is attached to the inner edge of the tibia ?

Ans. The interosseous ligament.

Ques. 53. What is the situation and direction of the canal of the medullary artery ?

Ans. It is situated somewhat above the middle of the posterior side of the bone, and slants downward.

Ques. 54. What is the form of the lower part of the tibia ?

Ans. It is much smaller than the upper part.

Ques. 55. What is the use of the notch on the outside of the lower end of the tibia ?

Ans. It is a longitudinal depression for the end of the fibula.

Ques. 56. What is the name and use of the process on the inside of the lower end of the tibia ?

Ans. It is called its malleolus internus, and gives attachment to a strong ligament.

Ques. 57. How is the trochlea which receives the astragalus formed ?

Ans. The lower end of the tibia and its malleolus internus, together with the lower end of the fibula or malleolus externus, form a trochlea or pulley-like cavity, in which plays the first bone of the foot.

Ques. 58. What are the connexions of the tibia ?

Ans. It is joined superiorly to the os femoris and patella ; laterally to the fibula, both above and below ; and inferiorly to the astragalus.

Patella.

Ques. 59. What is the situation of the patella ?

Ans. It is situated directly above the anterior tuberosity of the tibia.

Ques. 60. What is its general form ?

Ans. It is about half as thick as it is long; but its length and breadth are nearly equal.

Ques. 61. How is it divided?

Ans. Into a basis, an apex, and two sides.

Ques. 62. What is inserted into the base of the patella?

Ans. The base, which is turned upwards, gives attachment to the union of the vasti, rectus femoris, and cruralis.

Ques. 63. What is fixed to its apex?

Ans. The ligament of the patella.

Ques. 64. What is the appearance of its inner or posterior side?

Ans. It is somewhat concave, and divided into two by a middle ridge.

Ques. 65. Which of its depressions is the deepest?

Ans. The most external one.

Ques. 66. What is the structure of this bone?

Ans. It is of a spongy structure.

Ques. 67. What are its connexions?

Ans. It is connected to the anterior tuberosity of the tibia by a strong ligament, and is articulated with the pulley and condyles of the femur.

Fibula.

Ques. 68. What is the situation of the fibula?

Ans. It is placed on the outside of the leg.

Ques. 69. What is its general form?

Ans. It is a long slender bone, having three surfaces and edges, which are contorted in their course.

Ques. 70. How is it divided?

Ans. Into a body; an upper and a lower extremity.

Ques. 71. What is the form of the head of the fibula?

Ans. It is obliquely flattened by a small articular plane

internally, and has upon its outer side a small tuberosity.

Ques. 72. What is fixed to this tuberosity ?

Ans. The tendon of the biceps and the external lateral ligament.

Ques. 73. With what is the articular surface of the head of the fibula articulated ?

Ans. With a similar one on the tibia.

Ques. 74. What is the form of the body of this bone ?

Ans. The circumference of its body is irregularly triangular.

Ques. 75. To what part of the body of the fibula is the interosseous ligament fixed ?

Ans. To the inner side.

Ques. 76. What is the situation and direction of the canal of the medullary artery of this bone ?

Ans. It is placed about the middle of the posterior side of the bone, and slants downwards.

Ques. 77. What is the form of the lower end of the fibula ?

Ans. It is broader, flatter, and more oblong than the upper.

Ques. 78. What is attached to the inferior articular surface of the fibula ?

Ans. The outer articular surface of the astragalus.

Ques. 79. What is attached to the tuberosity of the lower end of the fibula ?

Ans. A strong ligament.

Ques. 80. What are the connexions of this bone ?

Ans. It is connected laterally to the tibia both above and below, and inferiorly to the astragalus.

Bones of the Foot.

Ques. 81. How are the bones of the foot divided ?

Ans. They are arranged under three classes ; namely, those of the tarsus, metatarsus, and toes.

Tarsus.

Ques. 82. What is the situation of the tarsus ?

Ans. They form the posterior part of the foot.

Ques. 83. Of what bones does the tarsus consist ?

Ans. It consists of seven bones ; namely, the astragalus ; os calcis ; os scaphoides ; os cuboides ; and the three ossa cuneiformia—the internum, medium, and externum.

Ques. 84. Which is the superior bone of the tarsus ?

Ans. The astragalus, which, with the bones of the leg, forms the ankle joint.

Ques. 85. What is the general form of the astragalus ?

Ans. It is extremely irregular ; but may be divided into a body or posterior portion, and an apophysis or anterior portion.

Ques. 86. What is the form of the superior articular surface of the astragalus ?

Ans. It resembles a half pulley.

Ques. 87. What is the appearance of its inferior surface ?

Ans. It is divided into two articular facettes by a deep transverse groove.

Ques. 88. With what do these articular surfaces connect ?

Ans. They are united to corresponding ones on the os calcis.

Ques. 89. What is united to the anterior articular surface of this bone ?

Ans. The os naviculare.

Ques. 90. What is the situation of the os calcis ?

Ans. It is placed at the posterior and inferior part of the tarsus, and forms the heel.

Ques. 91. What is its shape ?

Ans. It is of an irregular oblong form.

Ques. 92. What is the appearance of its superior surface ?

Ans. It is divided by a groove, which separates two articular surfaces for its union with the astragalus.

Ques. 93. What is its appearance posteriorly ?

Ans. It is broad, unequally convex, and rough posteriorly.

Ques. 94. What is attached to its rough portion at its posterior end ?

Ans. The tendo-Achilles.

Ques. 95. What is its appearance on its lower surface ?

Ans. It is narrow and rough.

Ques. 96. What is the appearance of its anterior side ?

Ans. It has a concave articular surface anteriorly.

Ques. 97. What is attached to its anterior side ?

Ans. The os cuboides.

Ques. 98. What is the appearance of the outer side of the os calcis ?

Ans. It is very rough and broad.

Ques. 99. What is the appearance of its inner side ?

Ans. It is concave.

Ques. 100. What is lodged in this concavity ?

Ans. Several muscles and tendons, as well as many vessels and nerves going to the foot.

Ques. 101. What is the situation of the os scaphoides ?

Ans. It is placed immediately before the astragalus ?

Ques. 102. What is its form ?

Ans. As its name implies, it somewhat resembles a small boat ; and has an anterior and a posterior cartilaginous surface ; an oval circumference ; and an inferior tuberosity.

Ques. 103. What is attached to its inferior concave side ?

Ans. The head of the astragalus.

Ques. 104. What is attached to its anterior convex side ?

Ans. The three ossa cuneiformia.

Ques. 105. What is fixed to its tuberosity ?

Ans. It gives attachment to a portion of the abductor pollicis and tibialis anticus.

Ques. 106. What is the situation of the os cuboides ?

Ans. It is situated before the os calcis on the outside of the os naviculare.

Ques. 107. What is its form ?

Ans. It has six irregular sides.

Ques. 108. What is the appearance of its lower side ?

Ans. Its inferior surface is rough, and before an oblique eminence there is a well marked groove.

Ques. 109. What passes in this groove ?

Ans. The tendons of the peroneus longus.

Ques. 110. What is the appearance of its posterior side ?

Ans. It is articular.

Ques. 111. What is it united to on its anterior side ?

Ans. The os calcis.

Ques. 112. What is the appearance of its anterior side ?

Ans. It is also articular, flat, and divided into two portions by a narrow faint line.

Ques. 113. What is united to its anterior side ?

Ans. The fourth and fifth bones of the metatarsus.

Ques. 114. What is the appearance of its inner side ?

Ans. It has upon it a round cartilaginous surface, and the rest of it is rough.

Ques. 115. What is attached to this cartilaginous surface ?

Ans. The os cuneiforme externum.

Ques. 116. What is the appearance of the outside of the os cuboides ?

Ans. It is irregular, short, and narrow.

Ques. 117. What is the appearance of its upper side ?

Ans. It is flat and rough for the attachment of ligaments.

Ques. 118. What is the situation of the ossa cuneiformia ?

Ans. They are situated before the os scaphoides, and internal to the os cuboides.

Ques. 119. What is the relative size of the ossa cuneiformia ?

Ans. The internal is the largest, and the external is the least.

Ques. 120. Into what parts are they divided ?

Ans. Each cuneiforme bone has a base supèriorly ; an apex inferiorly ; and a posterior, an anterior, an external, and an internal side.

Ques. 121. What is the form of the os cuneiforme internus ?

Ans. It somewhat resembles a wedge contorted and bent, and has its base turned downward.

Ques. 122. What is the form of the os cuneiforme medium ?

Ans. It more resembles a wedge, and has its base turned upward.

Ques. 123. What is the form of the os cuneiforme externum ?

Ans. It also resembles a wedge, and has its base turned upward.

Metatarsus.

Ques. 124. What is the situation of the metatarsus ?

Ans. The metatarsus forms the middle part of the foot.

Ques. 125. Of how many bones does the metatarsus consist ?

Ans. Of five bones ; one supporting each toe.

Ques. 126. What is the general form of the bones of the metatarsus ?

Ans. They are longer and more slender than the metacarpal bones.

Ques. 127. Into what parts are they divided ?

Ans. They may be divided into a body, basis, and head.

Ques. 128. What is the form of their bases ?

Ans. They resemble a wedge whose edges are turned downward.

Ques. 129. What is the form of their bodies ?

Ans. Their bodies are long and slender and flattened on each side.

Ques. 130. What is the form of their heads ?

Ans. Their heads or anterior extremities are convex and smooth, much flattened laterally, and are joined to the toes.

Ques. 131. Which is the largest of the metatarsal bones ?

Ans. The first one.

Ques. 132. What is peculiar to the fifth metatarsal bone ?

Ans. It is distinguished by a rough projection from its base, to which is attached the peroneus brevis.

Ques. 133. What are the connexions of the metatarsal bones ?

Ans. They are joined to the tarsus, and to each other

posteriorly, and to the first phalanges of the toes anteriorly.

Bones of the Toes.

Ques. 134. What is the number of the bones of the toes?

Ans. The five toes are formed by fourteen bones; three belonging to each of the four lesser toes, and two to the great toe.

Ques. 135. How are they arranged?

Ans. They are arranged precisely as the fingers.

Ques. 136. What is the form of the first bone of the great toe?

Ans. It somewhat resembles the second bone of the thumb; its base is considerably hollow, and its head resembles a pulley.

Ques. 137. What is the form of the second bone of the great toe?

Ans. It resembles the last of the thumb, but is much larger, and its anterior edges more unequal.

Ques. 138. What is the form of the first bones of the other toes?

Ans. The first bones of the other toes are the largest, but are shorter, narrower, and more convex than those of the fingers.

Ques. 139. What is the form of the second bones of the toes?

Ans. They are very short, and almost of the same oblong form.

Ques. 140. What is the form of the third bones of the toes?

Ans. They nearly resemble those of the fingers.

Ques. 141. What is the form and situation of the sesamoid bones?

Ans. They are small oval bones, chiefly found under the first joint of the great toe.

SECTION X.

FEMALE SKELETON.

Ques. 1. How do the bones of the female differ from those of the male?

Ans. They are smaller and less strongly marked than those of the male. All muscular attachments, depressions, and protuberances are smaller.

Ques. 2. Whether is the skull of the female, or that of the male proportionally largest?

Ans. The skull of the female is said to be larger, though more delicate.

Ques. 3. How does the os frontis differ from that of the male?

Ans. The sinuses are less capacious, and it is more frequently divided by a suture down the middle.

Ques. 4. How do the clavicles differ from those of the male?

Ans. They are straighter.

Ques. 5. How does the sternum differ?

Ans. It is shorter, and more elevated below.

Ques. 6. How do the cartilages of the true ribs differ?

Ans. They are larger, broader, and flatter, to support the mammæ.

Ques. 7. What is the difference in the vertebræ?

Ans. The bodies of the vertebræ are deeper.

Ques. 8. What is the difference in the os sacrum?

Ans. It is broader and set more backward.

Ques. 9. What is the difference in the os coccygis?

Ans. It is more moveable.

Ques. 10. How do the ossa ilii differ from those of the male?

Ans. They are broader, and turned outwards.

Ques. 11. How does the arch of the pubis and the ischiatic notch differ from these parts in the male subject?

Ans. They are larger.

Ques. 12. What is the difference in the tuberosities of the ischia of the female?

Ans. They are more distant and flatter.

Ques. 13. How do the ossa femorum differ?

Ans. They are more distant, and the angle of the neck with the body of the bone is greater.

Ques. 14. What parts of the female skeleton offer the most striking differences from that of the male?

Ans. The pelvis shows the most distinct characters of difference between the male and female skeleton. In the female, though the bones of the pelvis are less massy and rough, the cavity they form is more capacious; the ilia more expanded; the brim more rough, and of an oval form, its greatest diameter being from side to side; the outlet more expanded; the arch of the pubis greater; and the tuberosities of the ischia more distant from each other.

CHONDROLOGY.

SECTION XI.

OF CARTILAGES.

Ques. 1. What are cartilages ?

Ans. They are white, elastic, smooth, and very compact substances ; in density next to bone.

Ques. 2. How many kinds of cartilages are there ?

Ans. There are four kinds : 1st, diarthrodial ; 2d, synarthrodial ; 3d, interarticular ; and, 4th, cartilages which through life supply the place of bone.

Ques. 3. What are diarthrodial cartilages ?

Ans. They cover the ends of bones forming moveable joints.

Ques. 4. What are their use ?

Ans. They afford a highly polished surface, favourable to the motions of the joint ; and their elasticity renders violent movements less dangerous.

Ques. 5. What are synarthrodial cartilages ?

Ans. They are placed between several bones, having no perceptible motions on each other, as the bones of the pubis, &c.

Ques. 6. What are their use ?

Ans. They answer the purpose of a bond of union, and also prevent the ill effects of shocks from sudden and violent motions.

Ques. 7. What are interarticular cartilages ?

Ans. They are placed in some joints between bones ; as in the joint of the lower jaw, the clavicle with the sternum, and the knee joint.

Ques. 8. What is their use ?

Ans. They prevent the ill effects of friction, enlarge the articular cavity, and extend the mobility of the joint.

Ques. 9. In what parts does cartilage supply the place of bone ?

Ans. In the nose, the larynx, trachea, and part of the chest.

SYNDESMOLOGY.

SECTION XII.

OF THE LIGAMENTS OF THE HEAD AND TRUNK.

Ques. 1. What are ligaments ?

Ans. They are strong, flexible substances, usually connecting those bones together, which form moveable joints.

Ques. 2. How many kinds of ligaments are there ?

Ans. There are two kinds ; 1st, the capsular ; 2d, the connecting ligaments.

Ques. 3. What are capsular ligaments ?

Ans. They surround the joints on all sides.

Ques. 4. What is the use of capsular ligaments ?

Ans. They form bags which retain, and probably secrete the synovia, whilst they contribute to the union of the bones.

Ques. 5. What are connecting ligaments ?

Ans. They are usually of a firmer and more fibrous texture than the capsular.

Ques. 6. What are their use ?

Ans. They strengthen considerably the union of bones ?

Ques. 7. What names are usually given to the connecting ligaments ?

Ans. They are called lateral, crucial, round, &c., according to their situations or form.

Ques. 8. What other kinds of ligamentous substances are there ?

Ans. There are some answering the purposes of bones, others strengthening the union of bones, not moving on each other ; these two kinds may be found about the pelvis. A third kind are the elastic ligaments ; they exist about the vertebræ, in some animals they are very common ; of this nature is the ligamentum nuchæ in the neck of grazing animals.

Ques. 9. What are the ligaments of the lower jaw ?

Ans. There are two on each side ; a capsular and a lateral ligament.

Ques. 10. What is the situation of the capsular ligament of the lower jaw ?

Ans. It arises around the articular surface of the squamous portion of the temporal bone ; and, inclosing in its passage downward an inarticular cartilage, it is fixed round the condyloid process of the lower jaw.

Ques. 11. What is the situation of the lateral ligament of the lower jaw ?

Ans. It arises from the root of the styloid process of the temporal bone, and is inserted into the inside of the angle of the lower jaw.

Ques. 12. What are the ligaments of the vertebræ in general ?

Ans. For the union of the vertebræ there are seven kinds of ligaments ; namely, the common anterior ligament, common posterior, crucial or intervertebral, the capsules of the oblique processes, intertransverse, subflava, and interspinous.

Ques. 13. What is the situation of the common anterior ligament of the vertebræ ?

Ans. It arises from the forepart of the first vertebræ, and covers the anterior part of the whole spinal column as far down as the os sacrum.

Ques. 14. What is the situation of the common posterior ligament?

Ans. It arises from the anterior part of the foramen magnum, and covers the posterior part of the bodies of the vertebræ to the termination of the os sacrum.

Ques. 15. Where are the crucial or intervertebral ligaments?

Ans. They cross each other obliquely from the edge of one vertebræ to that of another.

Ques. 16. Where are the capsules of the oblique processes?

Ans. They arise from the edge of one oblique process, and surround that of another.

Ques. 17. What is the situation of the intertransverse ligaments?

Ans. They pass between the transverse processes of the vertebræ.

Ques. 18. Where is the ligamenta subflava?

Ans. It connects the bony arches of the vertebræ.

Ques. 19. Where is the interspinous ligaments?

Ans. They connect the spinous processes of the vertebræ.

Ques. 20. What are the ligaments peculiar to the cervical vertebræ?

Ans. They are the ligamentum nuchæ common to all the vertebræ of the neck, and the transverse ligament belonging to the two first.

Ques. 21. What is the situation of the ligamentum nuchæ?

Ans. It arises from the spine of the occiput, and is attached to the spinous processes of all the cervical vertebræ.

Ques. 22. What is the situation of the transverse ligament of the atlas?

Ans. It is attached to a small tuberosity, on each side of the articular depression behind the anterior arch of the

atlas, and encloses the tooth-like process of the dentatus. It sends one process up to the occiput and another down to the inferior vertebræ.

Ques. 23. What are the ligaments from the first vertebræ to the occiput?

Ans. They are four in number; being those of the anterior and posterior arches of the atlas and the capsular ligaments for the condyles.

Ques. 24. What are the ligaments from the second vertebræ to the occiput?

Ans. They are three in number; namely, one perpendicular, and two lateral.

Ques. 25. What is the situation of the perpendicular ligament?

Ans. It arises from the tip of the tooth-like process of the second vertebra, and is inserted into the edge of the foramen magnum between the condyles.

Ques. 26. What is the situation of the lateral ligaments?

Ans. They arise from each side of the processus dentatus, and are inserted into the occiput before the condyles, and also into the inside of the atlas.

Ques. 27. What are the ligaments connecting the ribs and vertebræ?

Ans. They are of six kinds; viz., the capsular of the heads of the ribs; the capsular of the tubercles of the ribs; the external ligaments of the necks of the ribs; the internal ligaments of the necks of the ribs; the external transverse ligaments; and the internal transverse ligaments.

Ques. 28. Where are the capsules of the heads of the ribs?

Ans. They surround the junction of the ribs with the bodies of the vertebræ.

Ques. 29. What is the situation of the capsules of the tubercles of the ribs?

Ans. They surround the junction of the ribs with the transverse processes of the vertebræ.

Ques. 30. Where are the external ligaments of the neck of the ribs ?

Ans. They arise from the roots of the oblique processes, and are inserted into the necks of the ribs.

Ques. 31. What is the situation of the internal ligaments ?

Ans. They arise from the lower edges of the transverse processes, and are inserted into the internal part of the necks of the ribs.

Ques. 32. Where is the external transverse ligament ?

Ans. It arises from the transverse process, and is inserted into the angle of each rib.

Ques. 33. Where is the internal transverse ligament ?

Ans. It arises from the body of each vertebra, and is inserted anteriorly a little beyond the head of each rib.

Ques. 34. What are the ligaments connecting the ribs to each other ?

Ans. They are called coruscating ligaments, and pass between their cartilages.

Ques. 35. What are the ligaments connecting the ribs and sternum ?

Ans. They are of two kinds ; capsular and transverse.

Ques. 36. What is the situation of the capsules of the anterior ends of the ribs ?

Ans. They connect the ribs to the depressions of the sternum.

Ques. 37. What is the situation of the external and internal transverse ligaments ?

Ans. They externally and internally connect the cartilages of the ribs to the sternum.

Ques. 38. What are the proper ligaments of the sternum ?

Ans. There are two ; viz., the common membrane of the sternum, and the ligaments of the Xiphoid cartilage.

Ques. 39. What are the ligaments of the pelvis ?

Ans. Anteriorly there are three, viz., Poupart's ligament, the annular ligament, and the obturator ligament ; posteriorly there are five, viz., transverse, the ilio-sacral, the ligamentum vasa, the short ischiatic, and the long ischiatic ligament.

Ques. 40. What is the situation of Poupart's ligament ?

Ans. It arises from the anterior superior spinous process of the ilium, and is inserted into the angle of the pubis. Some of its fibres are inserted into the pubis before it reaches the angle ; and it is these which are to be divided in Gimbernat's operation for female hernia.

Ques. 41. What is the situation of the annular ligament ?

Ans. It surrounds the articulation of the ossa pubis.

Ques. 42. Where is the obturator ligament ?

Ans. It closes up the foramen thyroideum, leaving only a small notch at its superior part.

Ques. 43. What is the situation of the transverse ligament ?

Ans. It arises from the transverse processes of the fourth and fifth lumbar vertebræ, and is inserted into the posterior superior spinous process of the ilium.

Ques. 44. What is the situation of the ilio-sacral ligament ?

Ans. It arises from the superior posterior spine of the ilium, and is inserted into the back of the sacrum.

Ques. 45. Where is the ligamenta vasa ?

Ans. The ligamenta vasa are numerous small ligaments which pass from the ilium to the sacrum anteriorly and posteriorly.

Ques. 46. What is the situation of the short sacro-ischiatic ligament ?

Ans. It arises from the spine of the ischium, and is in-

serted into the posterior part of the transverse process of the sacrum.

Ques. 47. What is the situation of the long sacro-ischiatic ligament?

Ans. It arises from the internal edge of the tuberosity of the ischium, and is inserted along with the short one.

Ques. 48. What are the ligaments of the os coccygis?

Ans. They are four in number; viz., a capsular, an anterior, a posterior, and a lateral ligament.

SECTION XIII.

OF THE LIGAMENTS OF THE UPPER EXTREMITY.

Ques. 1. What are the ligaments of the sternal extremity of the clavicle?

Ans. There are three connecting the clavicle to the sternum; namely, the capsular, the interclavicular, and the rhomboid ligaments.

Ques. 2. What is the situation of the capsular ligament?

Ans. It arises around the depression of the sternum, and involving an interarticular cartilage is inserted around the end of the clavicle.

Ques. 3. Where is the interclavicular ligament?

Ans. It passes behind the sternum, from the end of one clavicle to that of the other.

Ques. 4. Where is the rhomboid ligament?

Ans. The rhomboid, or, as it has sometimes been called, the costo-clavicular ligament, connects the first rib and clavicle near the sternum.

Ques. 5. What are the ligaments connecting the clavicle and scapula?

Ans. They are three in number, viz., the capsular, the conoid, and the trapezoid.

Ques. 6. What is the situation of the capsular ligament?

Ans. It arises around the sternal end of the clavicle, and is fixed round the articular surface of the acromion.

Ques. 7. Where is the conoid ligament?

Ans. The conoid or coraco-clavicular ligament arises pointed from the root of the coracoid process, and is inserted into the inferior side of this end of the clavicle.

Ques. 8. Describe the situation of the trapezoid ligament.

Ans. It differs in form from the last, but has nearly the same origin and insertion.

Ques. 9. What are the ligaments proper to the scapula?

Ans. There are two; the anterior and posterior.

Ques. 10. Describe the anterior.

Ans. It arises from the upper edge of the acromion, and is inserted into that of the coracoid process; it is also called coraco-acromial ligament.

Ques. 11. What is the situation of the proper posterior ligament?

Ans. It arises from the root of the coracoid process, and passes over the notch to the superior costa of the bone.

Ques. 12. What are the ligaments connecting the scapula and humerus?

Ans. They are two in number, viz. : the capsular and the upper part of the tendon of the biceps.

Ques. 13. Describe the capsular ligament.

Ans. It arises from the margin of the glenoid cavity, and is inserted round the neck of the humerus.

Ques. 14. What is the situation of the tendon of the biceps muscle ?

Ans. It arises from the upper edge of the glenoid cavity, passes through the joint, and being fixed in its groove by a strong sheath, it contributes to strengthen the shoulder joint.

Ques. 15. What are the ligaments proper to the humerus ?

Ans. They are two in number, viz. : the external and internal intermuscular.

Ques. 16. Describe the external intermuscular ligament.

Ans. It arises from the external condyle, and is inserted into the middle of the outside of the bone.

Ques. 17. What is the situation of the internal intermuscular ?

Ans. It arises from the internal condyle, and is inserted into the middle of the inside of the bone.

Ques. 18. What are the ligaments connecting the humerus to the radius and ulna ?

Ans. There are three, viz. : the capsular, and the external and internal lateral.

Ques. 19. What is the situation of the capsular ligament ?

Ans. It arises round the trochlea of the humerus, and is inserted around the heads of the radius and ulna.

Ques. 20. Describe the external lateral ligament.

Ans. It arises from the external condyle of the humerus, and is inserted into the outside of the neck of the radius.

Ques. 21. Where is the internal lateral ligament ?

Ans. It arises from the internal condyle, and is inserted into the inner side of the coronoid process of the ulna?

Ques. 22. What are the ligaments connecting the radius and ulna?

Ans. They are four in number, namely, the coronary, the oblique, the interosseous, and the sacciforme.

Ques. 23. Describe the coronary ligament.

Ans. It arises from the ulna, and surrounds the head of the radius.

Ques. 24. Where is the oblique ligament?

Ans. It arises from the base of the coronoid process of the ulna, and is inserted into the tubercles of the radius.

Ques. 25. What is the situation of the interosseous ligament?

Ans. It is attached to the acute edges of these bones, turned towards each other.

Ques. 26. Describe the situation of the sacciforme ligament?

Ans. It unites in a distinct articulation the lower ends of the radius and ulna.

Ques. 27. What are the ligaments from the radius and ulna to the carpus?

Ans. They are three in number, viz., the capsular, the external, and the internal lateral; between the end of the ulna and the os naviculare, a triangular, interarticular cartilage is placed.

Ques. 28. Describe the capsular ligament.

Ans. It arises around the lower articular surfaces of the radius and ulna, and is inserted round the three first bones of the carpus.

Ques. 29. Where is the external lateral ligament?

Ans. It arises from the styloid process of the radius, and is inserted into the outside of the os scaphoides.

Ques. 30. What is the situation of the internal lateral ligament?

Ans. It arises from the styloid process of the ulna, and

is inserted into the outside of the os cuneiforme and os unciforme.

Ques. 31. What are the ligaments of the carpus?

Ans. They are of five kinds, viz., the capsular, the transverse, the posterior annular, and the vaginal.

Ques. 32. Describe the capsular ligament.

Ans. It surrounds and connects all the carpal bones.

Ques. 33. What is the situation of the transverse?

Ans. It passes from bone to bone, and ties them together.

Ques. 34. Describe the posterior annular ligament.

Ans. It binds down the tendons of the extensor muscles to the back of the carpus.

Ques. 35. Where is the anterior annular?

Ans. It arises from the os pisiforme, and os unciforme, and is inserted into the trapezium, under which pass the flexor tendons.

Ques. 36. Describe the vaginal ligaments.

Ans. They proceed from within the anterior annular and sheathe the flexor tendons.

Ques. 37. What are the ligaments of the bases of the metacarpal bones?

Ans. They are of four kinds, viz. the capsular, the lateral, the dorsal, and the palmar.

Ques. 38. Describe the capsular ligaments.

Ans. They are derived from that of the carpus, which includes the bases of these bones.

Ques. 39. Where are the lateral ligaments?

Ans. They are situated on each side of the articulations.

Ques. 40. Describe the dorsal ligaments.

Ans. They are transverse ligaments, connecting the bases of these bones, on the back of the hands.

Ques. 41. What is the situation of the palmar ligaments?

Ans. They connect the bases of the metacarpal bones in the palm.

Ques. 42. What are the ligaments of the heads of the metacarpal bones?

Ans. They are of three kinds, viz., the capsular, lateral, and transverse.

Ques. 43. What are the ligaments of the joints of the fingers?

Ans. They are at each joint capsular and lateral.

SECTION XIV.

OF THE LIGAMENTS OF THE LOWER EXTREMITY.

Ques. 1. What are the ligaments connecting the os innominatum and the femur?

Ans. There are two, viz., a capsular and a round ligament.

Ques. 2. What is the situation of the capsular ligament?

Ans. It arises from the margin of the acetabulum, and is inserted around the root of the neck of the femur, a reflected layer of this ligament passes up the neck to the edges of the head of the bone, and transverse ligaments connect the one layer with the other.

Ques. 3. Describe the round ligament.

Ans. It arises from the small depression of the head of the femur, and is inserted into the middle of the acetabulum.

Ques. 4. What are the ligaments which connect the femur with the tibia and fibula?

Ans. There are six ligaments connecting these bones, viz., the capsular, popliteal, internal lateral, external lateral, anterior crucial, and posterior crucial.

Ques. 5. Describe the capsular ligament.

Ans. It passes from the edges of the articular surface of the femur to those of the tibia, being attached also to the patella.

Ques. 6. Where is the popliteal ligament?

Ans. It arises from the external condyle of the femur, and, passing in the posterior part of the capsule, is expanded upon the internal side of the joint.

Ques. 7. What is the situation of the external lateral ligament?

Ans. It arises from the external condyle, and is inserted into the head of the fibula. It generally divides itself into two portions.

Ques. 8. Describe the internal lateral ligament.

Ans. It arises from the internal condyle, and is inserted into the inside of the head of the tibia.

Ques. 9. Where is the posterior crucial?

Ans. It arises from the inside of the notch, between the condyles of the femur, and is inserted into the posterior part of the rough ridge on the top of tibia.

Ques. 10. Describe the anterior crucial.

Ans. It arises from the outside of the notch, between the condyles of the femur, and is inserted into the middle of the ridge on the top of the tibia.

Ques. 11. What are the ligaments of the patella?

Ans. They are of two kinds; the anterior ligament and the alar ligament.

Ques. 12. Describe the anterior ligament.

Ans. It arises from the inferior point of the patella, and is inserted into the anterior tuberosity of the tibia.

Ques. 13. Where are the alar ligaments?

Ans. They proceed on each side from the inner side of the capsular, and are inserted into the sides of the patella.

Ques. 14. What are the ligaments connecting the tibia and fibula?

Ans. There are three, namely, the capsular, the interosseous, and the transverse.

Ques. 15. What is the situation of the capsular ligament?

Ans. It connects the upper extremities of the tibia and fibula.

Ques. 16. Describe the interosseous ligament.

Ans. It connects the outer edge of the tibia to a ridge on the inner side of the fibula.

Ques. 17. Where are the transverse ligaments?

Ans. They connect the lower end of the fibula to that of the tibia, anteriorly and posteriorly.

Ques. 18. What are the ligaments connecting the tibia and fibula to the tarsus?

Ans. They are five in number, viz., the capsular, the deltoid, and the anterior, middle, and posterior ligaments of the fibula.

Ques. 19. Describe the capsular ligament.

Ans. It surrounds the junction of the tibia and fibula with the astragalus.

Ques. 20. Where is the deltoid ligament?

Ans. It arises from the internal malleolus, and is inserted into the astragalus and naviculare.

Ques. 21. What is the situation of the anterior ligament?

Ans. It arises from the external malleolus, and is inserted into the outside of the astragalus.

Ques. 22. Where is the middle ligament?

Ans. It arises from the tip of the external malleolus, and is inserted into the outside of the os calcis.

Ques. 23. Describe the posterior ligament.

Ans. It arises from the back part of the external malleolus, and is inserted into the back part of the astragalus.

Ques. 24. What are the ligaments of the tarsus?

Ans. They are of three kinds, namely, the capsular, the transverse, the plantar, and a ligament at the intersal side of the foot.

Ques. 25. What is the office of the capsular ligament?

Ans. It includes all the tarsal and the heads of the metatarsal bones.

Ques. 26. What is the use of the transverse ligaments?

Ans. They pass from one to another, and tie the individual bones together.

Ques. 27. Where is the plantar ligament situated?

Ans. On the outside of the sole of the foot.

Ques. 28. Where is the internal ligament?

Ans. It passes from the lower part of the os calcis to the lower part of the os naviculare, supporting the astragalus.

Ques. 29. What are the ligaments of the bases of the metatarsal bones.

Ans. They are of four kinds, namely, the capsular, the lateral, the dorsal, and the plantar.

Ques. 30. What are the capsular ligaments derived from?

Ans. From that of the tarsus, which includes the bases of these bones.

Ques. 31. Where are the lateral ligaments situated?

Ans. On each side of the articulations.

Ques. 32. Where are the dorsal ligaments?

Ans. They are transverse ligaments connecting these bones on the back of the foot.

Ques. 33. What is the situation of the plantar ligament?

Ans. It connects the metatarsal bones in the sole of the foot.

Ques. 34. What are the ligaments of the head of the metatarsal bones?

Ans. They of three kinds, namely, the capsular, the lateral, and the transverse.

Ques. 35. What are the ligaments of the joints of the toes?

Ans. They are capsular and lateral.

Ques. 36. How are the tendons of the foot and toes kept in their situations?

Ans. The tendons passing over the instep and behind the ancles are confined in their situations by ligamentous bands.

MYOLOGY.

Ques. 1. What are the muscles?

Ans. They are fleshy bodies, composed of bundles of parallel contractile fibres, with tendinous extremities.

Ques. 2. What is their general appearance?

Ans. The middle portion of them is generally their principal part. It is of a red colour, softer and thicker than the other parts, and is alone capable of contraction.

Ques. 3. What general names do muscles derive from the arrangement of their fibres?

Ans. If the fibres run longitudinally the muscle is termed simple; if they diverge from a tendinous centre they are named radiated; and when they have a feathery arrangement upon their tendons, they are called penniform; several of these united, are called complex penniform, &c.

Ques. 4. Whence are the particular names of the muscles in general derived?

Ans. They generally derive their names, either from their use as levators or depressors; from their form, as trapezius, rhomboideus, &c.; from their situation, as occipito-frontalis, pectoralis, &c.; or from their points of attachment, as sterno-costalis, sterno-cleido, mastoideus, &c.

Ques. 5. What are the tendons?

Ans. They are generally placed at the extremities of muscles, and are of a silvery hue, firm, compact, and incapable of contraction.

Ques. 6. What is called the origin of a muscle?

Ans. The least movable point of attachment is called the origin.

Ques. 7. What is called the insertion of a muscle?

Ans. Its most movable point of attachment.

SECTION XV.

OF THE MUSCLES OF THE TRUNK.

Ques. 1. What muscles arise from the trunk, and are inserted into it and the linea alba.

Ans. Five muscles arise from the trunk, and are inserted into it and the linea alba; viz., the obliquus externus abdominis descendens, the obliquus internus abdominis ascendens, the transversalis abdominis, the rectus abdominis, and the pyramidalis.

Ques. 2. What is the origin, insertion, and use of the obliquus externus abdominis descendens?

Ans. It arises from the inferior edges of the eight lower ribs, near their sternal ends, by an equal number of serrated digitations, which intermix with the digitations of the serratus anticus; posteriorly it is covered where it passes from the last rib to the crista ilii by the latissimus dorsi, to which it adheres; and superiorly it is connected

to the pectoralis major and intercostals; running downward and forward, it is inserted by a thin and broad tendon into a white line composed of tendons of the abdominal muscles called *linea alba*, extending from the last bone of the sternum to the pubis; but before this tendon reaches the *rectus abdominis*, it unites with the tendons of the *obliquus internus* and *transversalis*, and forms another white line called *linea semi-lunaris*; this muscle is also inserted into the middle of the *crista ilii*, and into Poupart's ligament, extending from its anterior spine to the angle of the pubis, and transmits over this ligament a fascia to the thigh; the lower part of its tendon, near the pubis, divides to form the abdominal ring for the spermatic cord in males; its use is to bend the body, or to raise the pelvis, and by compressing the abdomen to assist in respiration, in evacuating the feces, urine, and fœtus, &c.

Ques. 3. What is the origin, insertion, and use of the *obliquus internus abdominis ascendens*?

Ans. It arises from Poupart's ligament, about the middle of which it sends off the cremaster; from all the *crista ilii*, and by a common tendon, with the *serratus posticus inferior*, from the spines of the three lower lumbar vertebræ, and from the *os sacrum*; it is inserted into the last bone of the sternum, into the cartilage of the last true and those of all the false ribs, into all the *linea alba*, and into the anterior part of the pubis; it divides into two layers, the anterior passing before the posterior, except at its lower part, behind the *rectus abdominis* to the *linea alba*; its use is to assist the external oblique, and to bend the body in an opposite direction.

Ques. 4. What is the origin, insertion, and use of the *transversalis abdominis*?

Ans. It arises internally from the cartilages of the seven lower ribs, being there connected with the intercostals and diaphragm; also from the transverse process of the last vertebra of the back, from those of the four upper ver-

tebræ of the loins, from the inner edge of the crista ilii, and from part of Poupart's ligament; it is inserted into the inferior bone of the sternum, and almost all the length of the linea alba; its use is to compress the abdomen.

Ques. 5. What is the origin, insertion, and use of the rectus abdominis?

Ans. It arises from each side of the symphysis pubis; as it passes up, it has four tendinous intersections, and is sheathed by the tendons of the oblique and transverse muscles, joining fibres of the pectoral; it is inserted into the cartilages of the fifth, sixth, and seventh ribs; its use is to depress the trunk, or to elevate the pelvis, and to compress the abdomen.

Ques. 6. What is the origin, insertion, and use of the pyramidalis?

Ans. It arises between the origin of the recti from the symphysis pubis; it is inserted about one-fourth up the linea alba, into it and the inner edge of the recti; its use is to assist the recti.

Ques. 7. What muscles arise from the ribs and vertebræ and terminate in a central tendon.

Ans. The greater and lesser muscles of the diaphragm.

Ques. 8. What is the origin, insertion, and use of the greater muscle of the diaphragm?

Ans. It arises from the cartilages of all the false and of the last true rib, also from the last bone of the sternum; it forms a septum between the thorax and abdomen, which is concave inferiorly; it is inserted into a central tendon, towards the right side of which is a triangular foramen for the vena cava inferior; to its upper part the pericardium and mediastinum are attached; its use is to act in respiration, and to expel the feces and urine, and the fœtus in parturition.

Ques. 9. What is the origin, insertion, and use of the lesser muscle of the diaphragm?

Ans. It arises by eight slips from the second, third, and fourth lumbar vertebræ, which unite to form its crura; and between these pass the aorta and thoracic duct, on their outside the great sympathetic nerve, and some branches of the vena azygos; and about the middle of the fleshy belly of this muscle the œsophagus and eighth pair of nerves pass through a considerable foramen, called the left one, to distinguish it from that situated toward the right of its tendinous centre; it is inserted into the middle tendon posteriorly: its use is to assist the greater muscle.

Ques. 10. What muscle arises from the pelvis and vertebræ and is inserted into the ribs and vertebræ?

Ans. The longissimus dorsi.

Ques. 11. What is the origin, insertion, and use of the longissimus dorsi?

Ans. It arises from the spinous and transverse processes of the three upper false vertebræ, from the spinous and transverse processes of the lumbar vertebræ, and from the posterior spine of the os ilium; it is inserted into the transverse processes of the dorsal vertebræ, and into the lower edge of the ten upper ribs: its use is to extend the trunk.

Ques. 12. What muscle arises from the pelvis and vertebræ and is inserted into the ribs?

Ans. The sacro lumbalis.

Ques. 13. What is its origin, insertion, and use?

Ans. Its origin is the same as that of the longissimus dorsi; it is inserted into the curvature of the ribs: its use is to pull down the ribs, and to elevate the trunk.

Ques. 14. What muscle arises from the pelvis and vertebræ and is inserted into the vertebræ?

Ans. The multifidus spinæ.

Ques. 15. Where is the origin, insertion, and use of this muscle?

Ans. It arises from the posterior spine of the ilium, from the spinous and transverse processes of the upper

false vertebræ, from the transverse and oblique processes of the lumbar vertebræ, from the transverse processes of the dorsal, and from those of the four inferior cervical vertebræ; it is inserted into the spinous processes of all the true vertebræ, except the first; its use is to extend the vertebræ.

Ques. 16. What muscle arises from the pelvis, and is inserted into the ribs?

Ans. 'The quadratus lumborum.

Ques. 17. What is its origin, insertion, and use?

Ans. It arises from the posterior part of the crista ilii; it is inserted into the last rib, the side of the last dorsal vertebra, and the transverse processes of all the lumbar; its use is to bend the trunk to one side, and where both act to bend the trunk forward.

Ques. 18. What muscles arise from the vertebræ, and are inserted into the ribs?

Ans. There are six; namely, the scalenus anticus, the scalenus medius, the scalenus posticus, the cervicalis descendens, the serratus superior posticus, and serratus inferior posticus.

Ques. 19. What is the origin, insertion, and use of the scalenus anticus?

Ans. It arises from the transverse processes of the fourth, fifth, and sixth cervical vertebræ; it is inserted into the upper side of the first rib near its cartilage; its use is to bend the neck, or to elevate the ribs on one side.

Ques. 20. What is the origin, insertion, and use of the scalenus medius?

Ans. It arises from the transverse processes of the cervical vertebræ; it is inserted into the outer edge of the first rib till within an inch of its cartilage; its use is to assist the scalenus anticus.

Ques. 21. What is the origin, insertion, and use of the scalenus posticus?

Ans. It arises from the transverse processes of the fifth and sixth cervical vertebræ; it is inserted into the posterior part of the upper edge of the second rib; its use is to assist the scalenus anticus.

Ques. 22. What is the origin, insertion, and use of the cervicalis descendens?

Ans. It arises from the transverse processes of the five inferior cervical vertebræ; it is inserted into the six superior ribs; its use is to turn the neck obliquely backward, and to one side.

Ques. 23. What is the origin, insertion, and use of the serratus superior posticus?

Ans. It arises from the spinous processes of the three last cervical, and two uppermost dorsal vertebræ; it is inserted into the second, third, fourth, and fifth ribs; its use is to elevate the ribs.

Ques. 24. What is the origin, insertion, and use of the serratus inferior posticus?

Ans. It arises in common with the latissimus dorsi from the spinous processes of the two inferior dorsal and three superior lumbar vertebræ; it is inserted into the upper edges of the four lower ribs, near their cartilages; its use is to depress these ribs.

Ques. 25. What muscles arise from the vertebræ and are inserted into them?

Ans. There are twelve sets; namely, the longus colli, the splenius cervicis, the obliquus capitis inferior, the transversalis colli, the semispinalis colli, the spinalis dorsi, the semispinalis dorsi, the interspinalis colli, the interspinales dorsi et lumborum, the intertransversales colli et lumborum, and the intertransversales dorsi.

Ques. 26. What is the origin, insertion, and use of the longus colli?

Ans. It arises from the sides of the bodies of the three superior dorsal vertebræ, and from the roots of the transverse processes of the third, fourth, fifth, and sixth cer-

vical; it is inserted anteriorly into the bodies of all the cervical vertebræ; its use is to bend the neck forward and somewhat laterally.

Ques. 27. What is the origin, insertion, and use of the splenius cervicis?

Ans. It arises from the spinous processes of the third and fourth dorsal vertebræ; it is inserted into the transverse processes of the five superior cervical vertebræ; its use is to extend the neck.

Ques. 28. What is the origin, insertion, and use of the obliquus capitis inferior?

Ans. It arises from the spinous process of the second dorsal vertebræ; it is inserted into the transverse process of the first; its use is to rotate the head.

Ques. 29. What is the origin, insertion, and use of the transversalis colli?

Ans. It arises from the transverse processes of the five upper dorsal vertebræ, being situated between the trachelo mastoideus and the splenius cervicis and cervicalis descendens; it is inserted into the transverse processes of the five middle cervical vertebræ; its use is to turn the neck backward and somewhat laterally.

Ques. 30. What is the origin, insertion, and use of the semispinalis colli?

Ans. It arises from the transverse processes of the six upper dorsal vertebræ; it is inserted into the spinous processes of the five middle cervical vertebræ; its use is to extend the neck obliquely backward.

Ques. 31. What is the origin, insertion, and use of the spinalis dorsi?

Ans. It arises from the spinous processes of the two upper lumbar and three lower dorsal vertebræ; it is inserted into the spinous processes of the second, third, fourth, fifth, sixth, seventh, eighth, and ninth dorsal vertebræ; its use is to extend the spine.

Ques. 32. What is the origin, insertion, and use of the *semispinalis dorsi*?

Ans. It arises from the transverse processes of the seventh, eighth, ninth, and tenth dorsal vertebræ; it is inserted into the spinous processes of the two inferior cervical and the seven upper dorsal vertebræ; its use is to extend the spine obliquely.

Ques. 33. What is the origin, insertion, and use of the *interspinales colli*?

Ans. They arise from the spinous process of one cervical vertebræ, and are inserted into the spinous process of that next it; their use is to extend the neck.

Ques. 34. What are the *interspinales dorsi et lumborum*?

Ans. They appear to partake more of the nature of ligaments than muscles.

Ques. 35. What is the origin, insertion, and use of the *intertransversales colli et lumborum*?

Ans. They arise from the transverse process of one cervical or lumbar vertebræ, and are inserted into the transverse process of that next it; their use is to approximate their processes.

Ques. 36. What are the *intertransversales dorsi*?

Ans. They also seem to be ligamentous.

Ques. 37. What muscles arise from one rib and are inserted into another?

Ans. The *intercostales externi* and *intercostales interni*.

Ques. 38. What is the origin, insertion, and use of the *intercostales externi*?

Ans. They arise from the inferior edge of one rib between the spine and its cartilage, and are inserted into the upper edge of another; their fibres running from behind forward: their use is to elevate the ribs in inspiration.

Ques. 39. What is the origin, insertion, and use of the *intercostales interni*?

Ans. They arise from the inferior edge of one rib between the sternum and its angle, and are inserted like that of the external; they run from before backward; their use is to elevate the ribs in inspiration.

Ques. 40. What muscle arises from the sternum and is inserted into the ribs?

Ans. The *sterno-costalis*, or *triangularis sterni*.

Ques. 41. What is its origin, insertion, and use?

Ans. It arises from the edge of the *intercostales interni*, and from the anterior half of the middle bone of the sternum; it is inserted into the inferior edge of the cartilages of the third, fourth, and fifth ribs.

Ques. 42. What muscle arises from the *vertebræ* and is inserted into the pelvis?

Ans. The *psoas parvus*.

Ques. 43. What is its origin, insertion, and use?

Ans. It arises laterally from the bodies of the two upper lumbar *vertebræ*; it is inserted into the brim of the pelvis, opposite the *acetabulum* internally; its use is to aid in bending the loins.

Ques. 44. What muscles arise from one part of the pelvis and are inserted into another?

Ans. There are two, viz., the *coccygeus* and *curvato-coccygis*.

Ques. 45. What is the origin, insertion, and use of the *coccygeus*?

Ans. It arises from the spine of the ischium, and the inside of the lesser sacro-ischiatic ligament; it is inserted into the edge of the *os coccygis*; its use is to pull that bone forward.

Ques. 46. What is the origin, insertion, and use of the *curvator coccygis*?

Ans. It arises internally from the last bone of the *os sacrum*, and the first bone of the *os coccygis*; it is in-

serted, after having joined its fellow, into the second and third, but principally into the fourth bone of the os coccygis; its use is to curve the os coccygis.

SECTION XVI.

OF THE MUSCLES OF THE MALE ORGANS OF GENERATION AND ANUS.

Ques. 1. What muscle arises from the obliquus internus abdominis, and is inserted into the testis?

Ans. The cremaster.

Ques. 2. What is its origin, insertion, and use?

Ans. It arises from the internal oblique about the abdominal ring, through which it passes, and descends upon the spermatic cord; it is inserted into the tunica vaginalis testis; its use is to draw up the testis.

Ques. 3. What is the dartos?

Ans. It is supposed to be a muscle of the scrotum; but is, in fact, nothing more than condense cellular membrane.

Ques. 4. What muscles arise from the tuber ischii and are inserted about the penis?

Ans. There are three, viz., the erector penis, the transversus perinei, and transversus perinei alter.

Ques. 5. What is the origin, insertion, and use of the erector penis ?

Ans. It arises from the tuber ischii, and in its ascent surrounds the whole crus penis. It is inserted near the union of the crura penis. Its use is to direct, if not to erect the penis.

Ques. 6. What is the origin, insertion, and use of the transversus perinei ?

Ans. It arises from the tuber ischii, passing transversely inward and forward ; it is inserted into the accelerator urinæ and the sphincter ani, where the above mentioned muscles cover the bulb ; its use is to dilate the bulb while it draws up the verge of the anus.

Ques. 7. What is the origin, insertion, and use of the transversus perinei alter ?

Ans. It arises behind the transversus perinei, but runs more forward ; it is inserted into the accelerator, where it covers the bulb anteriorly ; its use is to assist the transversus perinei. This muscle is sometimes not to be found in some subjects.

Ques. 8. What muscle is that which arises from one part of the penis and is inserted into another ?

Ans. The accelerator urinæ, or ejaculator seminis.

Ques. 9. What is its origin, insertion, and use ?

Ans. It arises from the sphincter ani, the membranous part of the urethra and crus penis ; it is inserted into the middle of the bulb, and completely encloses it ; its use is to compress the bulb.

Ques. 10. What muscle arises from the pubis and is inserted about the prostate gland ?

Ans. The compressor prostatæ.

Ques. 11. What is its origin, insertion, and use ?

Ans. It arises above the levator ani from the internal part of the os pubis, between the lower part of the symphysis and the upper part of the foramen ovale ; it is inserted between the prostate and rectum, having surrounded

the former ; its use is to compress the inferior part of the prostate.

Ques. 12. What muscles arise from the pelvis and are inserted about the anus ?

Ans. There are three ; viz., the levator ani, the sphincter ani externus, and the sphincter ani internus.

Ques. 13. What is the origin, insertion, and use of the levator ani ?

Ans. It arises from the spine of the ischium, from the membrane covering the coccygeus and obturator internus, from the junction of the pubis and ischium, and from the pubis above the foramen thyroideum ; it is inserted, after surrounding the neck of the bladder, prostate, vesiculæ seminales, and the termination of the rectum, into the sphincter ani, acceleratores urinæ and tip of the os coccygis ; its use is to elevate the anus.

Ques. 14. What is the origin, insertion, and use of the sphincter ani externus ?

Ans. It arises from the tip of the os coccygis, and surrounds the anus ; it is inserted into the perineum, transversi perinei, and acceleratores urinæ ; its use is to shut the anus, and to pull down the bulb of the urethra.

Ques. 15. What is the sphincter ani internus ?

Ans. It may be considered to be that part of the fibres of the rectum which surrounds its extremity

SECTION XVII.

OF THE MUSCLES OF THE FEMALE ORGANS OF GENERATION
AND ANUS.

Ques. 1. What muscle is that which arises from the ischium and is inserted into the clitoris ?

Ans. The erector clitoridis.

Ques. 2. What is its origin, insertion, and use ?

Ans. It arises from the inner side of the branch of the ischium, and embraces the crus of the clitoris as far up as the os pubis ; it is inserted into the upper part of the crus and body of the clitoris ; its use is to draw the clitoris downward and backward.

Ques. 3. What muscle arises from the clitoris, and is inserted into the vagina ?

Ans. The sphincter vaginæ.

Ques. 4. What is its origin, insertion, and use ?

Ans. It arises from the union of the crura clitoridis. It is inserted into the sphincter ani and sides of the vagina, which it surrounds. Its use is to contract the mouth of the vagina.

Ques. 5. What muscle is that which arises from the tuber ischii, and is inserted into the perineum ?

Ans. The transversus perinei.

Ques. 6. What is its origin, insertion, and use ?

Ans. It arises from the cellular membrane, and the tuberosity of the ischium. It is inserted into the perineum, between the pudendum and anus, and into the phincter ani. Its use is to sustain the perineum.

Ques. 7. What muscle arises from the tuber ischii, and is inserted into the vagina?

Ans. The transversus perinei alter.

Ques. 8. What is its origin, insertion, and use?

Ans. Its origin resembles that of the transversus perinei; it is inserted into the side of the vagina; its use is to assist the transversus perinei.

Ques. 9. What muscle arises from one crus clitoridis and is inserted into the other?

Ans. The depressor urethræ.

Ques. 10. What is its origin, insertion, and use?

Ans. It arises from one crus of the clitoris, and involves the urethræ; it is inserted into the other crus of the clitoris; its use is to depress the urethra.

Ques. 11. What muscles arise from the pubis, and are inserted about the anus?

Ans. There are three, viz., the levator ani, the sphincter ani externus, and sphincter ani internus.

Ques. 12. What is the origin, insertion, and use of the levator ani?

Ans. It arises as in the male, and descends along the inferior part of the vagina and rectum; it is inserted into the perineum, sphincter ani, and extremities of the rectum and vagina; its use is to elevate the rectum and vagina.

Ques. 13. What is the origin, insertion, and use of the sphincter ani externus?

Ans. It arises, as in the male, from the tip of the os coccygis, and surrounds the anus; it is inserted into the perineum; its use is to shut the rectum, and by pulling down the perineum to contract the vagina.

Ques. 14. Describe the sphincter ani internus?

Ans. It exactly resembles that of the male.

SECTION XVIII.

OF THE MUSCLES OF THE HEAD, FACE, ETC.

Ques. 1. What muscle is that which arises from the integuments of the head and shoulder, and is inserted into those of the face ?

Ans. The platysma myoides.

Ques. 2. What is its origin, insertion, and use ?

Ans. It arises from the cellular substance covering the deltoid and pectoral muscles superiorly, and passes upward in a very thin layer almost immediately under the cutis of the neck ; it is inserted into the skin, covering the lower jaw between its angle and the chin ; also into that covering the masseter and parotid gland ; its use is to approximate the portions of integument into which it is inserted.

Ques. 3. How many muscles arise from the sternum, ribs, and vertebræ to be inserted into the head ?

Ans. There are ten, viz., the sterno-cleido mastoideus, the rectus capitis anticus major, the rectus capitis anticus minor, the rectus capitis lateralis, the splenius capitis, the complexus, the trachelo mastoideus, the rectus capitis posticus major, the obliquus capitis superior, and the rectus capitis posticus minor.

Ques. 4. Describe the origin, insertion, and use of the sterno-cleido mastoideus.

Ans. It arises from the upper surface of the sternum laterally, and from the upper and anterior part of the clavicle ; it is inserted into the mastoid process, and as far

back as the lambdoidal suture ; its use is to turn the head on one side, and bend it forward.

Ques. 5. Describe the origin, insertion, and use of the *rectus capitis anticus major*.

Ans. It arises from the anterior parts of the transverse processes of the third, fourth, fifth, and sixth cervical vertebræ, by distinct commencements ; it is inserted into the basilar process of the occipital bone, just before the condyles ; its use is to bend the head forward.

Ques. 6. What is the origin, insertion, and use of the *rectus capitis anticus minor* ?

Ans. It arises anteriorly from the first vertebra of the neck, opposite its superior oblique processes ; it is inserted near the root of the condyles of the *os occipitis* further out than the former muscle ; its use is to nod the head.

Ques. 7. Describe the origin, insertion, and use of the *rectus capitis lateralis*.

Ans. It arises anteriorly from the point of the transverse process of the first vertebra of the neck ; it is inserted into the ridge of the *os occipitis* external to the condyles ; its use is to bend the head to one or the other side.

Ques. 8. What is the origin, insertion, and use of the *splenius capitis* ?

Ans. It arises from the five inferior cervical spines and the *ligamentum nuchæ* ; they recede from each other at the third vertebra of the neck, and show between them the *complexus* ; it is inserted into the hollow of the *os occipitis* below its transverse ridge, and externally to the *complexus*, also into the mastoid process posteriorly ; its use is to pull the head backward and to one side.

Ques. 9. What is the origin, insertion, and use of the *complexus* muscle ?

Ans. It arises from the transverse processes of the four inferior cervical and seven superior dorsal vertebræ, also from the spinous process of the first dorsal ; it is inserted

into the hollow of the os occipitis below its transverse ridge; its use is to pull the head laterally backward.

Ques. 10. Describe the origin, insertion, and use of the trachelo-mastoideus.

Ans. It arises from the transverse processes of the five inferior cervical, and three superior dorsal vertebræ; it is inserted into the middle of the posterior part of the mastoid process; its use is to pull the head backward, but more laterally than the complexus.

Ques. 11. Describe the origin, insertion, and use of the rectus capitis posticus major.

Ans. It arises from the external part of the spine of the second cervical vertebra; it is inserted into the os occipitis about an inch behind the foramen magnum; its use is to pull the head backward and a little laterally.

Ques. 12. What is the origin, insertion, and use of the obliquus capitis superior?

Ans. It arises from the transverse process of the first cervical vertebra; it is inserted into the os occipitis externally to the rectus capitis posticus major, and below the complexus; its use is to pull the head backward.

Ques. 13. Describe the origin, insertion, and use of the rectus capitis posticus minor.

Ans. It arises from the middle of the posterior arch of the atlas; it is inserted into a depression immediately behind the foramen magnum; its use is to pull the head backward.

Ques. 14. What muscles arise from the skull and are inserted into the integuments?

Ans. The occipito frontalis and corrugator supercilii.

Ques. 15. What is the origin, insertion, and use of the corrugator supercilii?

Ans. It arises from the internal angular process of the os frontis, thence running outward and upward; it is inserted internally into the inferior part of the occipito fron-

talís; its use is to draw the eye-brows together, and to wrinkle the skin of the forehead longitudinally.

Ques. 16. Describe the origin, insertion, and use of the occipito frontalis.

Ans. It arises posteriorly from the transverse ridge of the os occipitis, becoming tendinous as it passes upward over the cranium; it is connected to the temporalis, the attollens aurem, and the zygoma, and advancing to the brow it becomes again muscular; it is inserted into the orbicularis and the skin of the eye-brows; its use is to raise the eye-brows and to pull backward, or to wrinkle the skin of the head.

Ques. 17. What muscles arise from the cranium and are inserted into the eye-lids?

Ans. The levator palpebræ superioris and orbicularis palpebrarum.

Ques. 18. Describe the origin, insertion, and use of the levator palpebræ superioris.

Ans. It arises from the upper part of the foramen opticum of the os sphenoides, above the levator oculi; it is inserted into the upper eye-lid; its use is to pull the eye-lid upward.

Ques. 19. What is the origin, insertion, and use of the orbicularis palpebrarum?

Ans. It arises at the inner angle of the eye, from the outside of the nasal process of the superior maxillary bone, and surrounding the eye externally; it is inserted, after having passed over the lachrymal sac, where it arose; its use is to shut the eye, press the eye-ball, squeeze the lachrymal gland, and convey the tears towards the puncta lachrymalia.

Ques. 20. How many muscles arise from the cranium and are inserted into the eye-ball, and what are their names?

Ans. There are six; viz., the levator oculi, depressor

oculi, adductor oculi, abductor oculi, trochlearis or obliquus superior, and obliquus inferior oculi.

Ques. 21. Describe the origin, insertion, and use of the levator oculi.

Ans. It arises from the upper part of the foramen opticum of the sphenoid bone, beneath the levator palpebræ superioris ; it is inserted into the superior and anterior part of the sclerotic coat ; its use is to elevate the ball of the eye.

Ques. 22. What is the origin, insertion, and use of the depressor oculi ?

Ans. It arises from the inferior part of the foramen opticum ; it is inserted opposite to the levator oculi ; its use is to depress the ball of the eye.

Ques. 23. Describe the origin, insertion, and use of the adductor oculi.

Ans. It arises from the edge of the foramen opticum between the obliquus superior and the depressor ; it is inserted opposite to the inner angle ; its use is to adduct or turn the eye towards the nose.

Ques. 24. What is the origin, insertion, and use of the abductor oculi ?

Ans. It arises from the outward edge of the foramen opticum ; it is inserted opposite to the outer angle ; its use is to turn the eye towards the temple.

Ques. 25. What is the origin, insertion, and use of the trochlearis or obliquus superior ?

Ans. It arises from the edge of the foramen opticum, between the levator and adductor oculi, thence turning to the cartilaginous trochlea on the inside of the internal angular process of the os frontis it passes through it, and turns its course downwards, outward, and backward ; it is inserted into the sclerotic coat, half way between the insertion of the levator and the optic nerve ; its use is to roll the ball of the eye from above inwardly, to pull it

forward, inward, and upward, and to turn the pupil downward and outward.

Ques. 26. What is the origin, insertion, and use of the obliquus inferior oculi ?

Ans. It arises from the outer edge of the orbital process of the superior maxillary bone near the depression for the lachrymal duct, running outward and backward ; it is inserted into the sclerotic coat between the abductor and the optic nerve ; its use is to roll the ball of the eye from above outwardly, to pull it forward, inward, and downward, to turn the pupil upward and inward.

Ques. 27. How many muscles arise from the cranium and are inserted into the external ear ?

Ans. There are three ; namely, the attollens aurem, anterior auris, and retrahens aurem.

Ques. 28. Describe the origin, insertion, and use of the attollens aurem.

Ans. It arises from the tendon of the occipito frontalis, where it covers the temporal aponeurosis ; it is inserted superiorly into the back of the concha ; its use is to elevate the ear.

Ques. 29. What is the origin, insertion, and use of the anterior auris ?

Ans. It arises from the posterior part of the zygoma ; it is inserted anteriorly into the back of the helix ; its use is to pull the ear forward.

Ques. 30. What is the origin, insertion, and use of the retrahens aurem ?

Ans. It arises often by three origins from the external parts of the root of the mastoid process ; it is inserted posteriorly into the back edge of the concha ; its use is to pull the ear backward.

Ques. 31. What muscles are attached wholly to the external ear ?

Ans. The helicis major, helicis minor, tragicus, anti-tragicus, and transversus auris.

Ques. 32. What is the origin, insertion, and use of the *helicis major* ?

Ans. It arises from the acute process of the helix ; it is inserted into the helix a little higher up ; its use is to contract that part of the helix.

Ques. 33. Describe the origin, insertion, and use of the *helicis minor*.

Ans. It arises from the inferior and anterior part of the helix, nearer its edge than the former ; it is inserted into the helix a little higher up ; its use is to bring together the edges of a fissure over which it passes.

Ques. 34. What is the origin, insertion, and use of the *tragicus* ?

Ans. It arises anteriorly from the middle of the anterior edge of the concha ; it is inserted into the tip of the tragus ; its use is to pull the point of the tragus forward.

Ques. 35. Describe the origin, insertion, and use of the *antitragus*.

Ans. It arises from the termination of the *antihelix* ; it is inserted into the tip of the *antitragus* ; its use is to approximate these points by shutting the fissure between them.

Ques. 36. What is the origin, insertion, and use of the *transversus auris* ?

Ans. It arises from the superior and posterior edge of the back of the concha ; it is inserted superiorly into the back of the fossa navicularis, and posteriorly into the back of the fossa innominata ; its use is to approximate these cavities.

Ques. 37. What muscles arise from the cranium, and are inserted into the ossicular auditus ?

Ans. There are four ; viz., the *laxator tympani major*, *laxator tympani minor*, *tensor tympani*, and the *stapedius*.

Ques. 38. What is the origin, insertion, and use of the *laxator tympani major* ?

Ans. It arises from the styliform process of the sphenoid bone, running backward it passes through the fissura glasseri; it is inserted into the long process of the malleus, where it rests upon the same fissure; its use is to pull the malleus and membrana tympani obliquely forward.

Ques. 39. Describe the origin, insertion, and use of the laxator tympani minor.

Ans. It arises from the superior posterior margin of the meatus auditorius, where the membrana tympani adheres to it, and descends inward and forward; it is inserted into the neck of the malleus near its short process; its use is to pull the malleus and membranæ tympani forward and upward.

Ques. 40. Describe the origin, insertion, and use of the tensor tympani.

Ans. It arises from the cartilaginous end of the eustachian tube and styliform process of the sphenoid bone, thence running back above the osseous part of the eustachian tube, within a thin osseous plate, it makes a turn forward into the tympanum; it is inserted posteriorly into the handle of the malleus below its long process; its use is to pull the malleus and membrana tympani inward.

Ques. 41. Describe the origin, insertion, and use of the stapedius.

Ans. It arises from a hollow pyramid on the posterior side of the tympanum, before the lower end of the fallopian aqueduct; it is inserted into the posterior part of the head of the stapes; its use is to pull the stapes upward and backward.

Ques. 42. What muscle arises from one part of the nasal cartilage, and is inserted into another?

Ans. The compressor naris.

Ques. 43. What is the origin, insertion, and use of the compresor naris?

Ans. It arises from the superior part of the cartilage of

the nose ; it is inserted into its inferior part ; its use is to compress the alæ.

Ques. 44. How many muscles arise from the cranium and are inserted into the nose and lips ?

Ans. There are two ; the levator labii superioris alæque nasi, and depressor labii superioris alæque nasi.

Ques. 45. What is the origin, insertion, and use of the levator labii superioris alæque nasi ?

Ans. It arises by two commencements ; one from the external edge of the orbital process of the superior maxillary bone, the other from the upper part of its nasal process ; it is inserted first into the upper lip and orbicularis labiorum, and secondly into the upper lip and outer part of the ala nasi ; its use is to elevate the upper lip and ala nasi.

Ques. 46. What is the origin, insertion, and use of the depressor labii superioris alæque nasi ?

Ans. It arises from the depression of the os maxillare superius, above the dentes incisivi and canini, thence running up under the levator ; it is inserted into the upper lip and root of the ala nasi ; its use is to draw the upper lip and ala nasi downward and backward.

Ques. 47. What muscle arises from the nose and is inserted into the upper lip ?

Ans. The nasalis labii superioris.

Ques. 48. What is its origin, insertion, and use ?

Ans. It arises from the tip and septum of the nose, enlarging and descending obliquely outward ; it is inserted into the orbicularis oris ; its use is to bring closer the angles of the mouth, or to depress the tip of the nose.

Ques. 49. What muscles arise from the cranium and are inserted into the lips ?

Ans. There are six ; viz., the depressor labii inferioris, levator labii inferioris, depressor anguli oris, buccinator, zygomaticus major, and zygomaticus minor.

Ques. 50. What is the origin, insertion, and use of the depressor labii inferioris ?

Ans. It arises anteriorly from the inferior part of the lower jaw ; it is inserted into the edge of the under lip ; its use is to depress the under lip.

Ques. 51. What is the origin, insertion, and use of the levator labii inferioris ?

Ans. It arises from the depression of the os maxillare inferius, below the dentes incisivi and caninus ; it is inserted into the under lip and skin of the chin ; its use is to pull the parts upward.

Ques. 52. What is the origin, insertion, and use of the depressor anguli oris ?

Ans. It arises from the inferior edge of the maxilla inferior, by the side of the chin ; it is connected externally to the integuments and to the platysma myoides, and internally to the depressor labii inferioris, becoming gradually narrower ; it is inserted into the angle of the mouth ; its use is to pull down the angle of the mouth.

Ques. 53. What is the origin, insertion, and use of the buccinator ?

Ans. It arises from the upper jaw behind the dens sapientiæ, where it is connected with the constrictor pharyngeus superior, and from the lower jaw as far back as its dens sapientiæ and the root of its coronoid process ; it is inserted into the angle of the mouth, within the orbicularis oris ; its use is to pull the angle of the mouth backward, and to press the chin inward.

Ques. 54. What is the origin, insertion, and use of the zygomaticus major ?

Ans. It arises from the zygomatic process of the os malæ ; it is inserted into the angle of the mouth ; its use is to draw upward and outward the corner of the mouth.

Ques. 55. What is the origin, insertion, and use of the zygomaticus minor ?

Ans. It arises from above the origin of the zygoma-

ticus major ; it is inserted into the upper lip, near the corner of the mouth ; its use is to draw upward and outward the corner of the mouth.

Ques. 56. What muscle arises at one part of the lips and is inserted at another ?

Ans. The orbicularis oris.

Ques. 57. What is its origin, insertion, and use ?

Ans. It arises from the other muscles of the lips, the superior fibres descending, the inferior ascending, and decussating each other about the angle of the mouth ; it is inserted into fibres from the opposite side ; its use is to shut the mouth and compress the lips.

Ques. 58. What muscle arises from one part of the upper jaw and is inserted into another ?

Ans. The anomalus maxillæ superioris.

Ques. 59. What is its origin, insertion, and use ?

Ans. It arises from the upper part of the fossa of the cuspidates of the upper jaw ; it is inserted below the origin of the first portion of the levator labii superioris, *alæque nasi ; its use is to act only on the vessels and nerves from the attachment of both its ends to one bone.

Ques. 60. What muscles arise from the cranium and are inserted into the lower jaw ?

Ans. There are five, viz., the temporalis, masseter, pterygoideus externus, pterygoideus internus, and digastricus.

Ques. 61. Describe the origin, insertion, and use of the temporalis.

Ans. It arises from the temporal ridge and depression of the os frontis and os parietale, from the temporal process of the sphænoid bone, and from the aponeurosis which covers it ; it is inserted around the coronoid process of the lower jaw ; its use is to pull the lower jaw upward and backward.

Ques. 62. Describe the origin, insertion, and use of the masseter.

Ans. It arises from the superior maxillary bone where it joins the os malæ, and from the inferior and interior part of the zygoma throughout its length, the external fibres starting backward, the internal forward; it is inserted into the outside of the angle and ramus of the lower jaw; its use is to elevate the lower jaw and to pull it a little forward or backward.

Ques. 63. Describe the origin, insertion, and use of the pterygoideus externus.

Ans. It arises from the outside of the external pterygoid process of the sphænoid bone, from part of the tuberosity of the os maxillare, and from the root of the temporal process of the os sphænoides; it is inserted into a cavity on the anterior part of the neck of the condyloid process of the lower jaw, and into the capsular ligament of the joint; its use is to pull the jaw forward and to the opposite side, and to pull the ligament from the joint.

Ques. 64. What is the origin, insertion, and use of the pterygoideus internus?

Ans. It arises from the pterygoid fossa of the sphænoid and palate bones; it is inserted into the angle of the lower jaw internally; its use is to pull the jaw upward, and towards the other side.

Ques. 65. What is the origin, insertion, and use of the digastricus?

Ans. It arises from the deep fossa at the root of the mastoid process of the temporal bone; becoming tendinous in the middle, it perforates the stylo-hyoideus and is fixed by a ligament to the os hyoides, and again ascends; it is inserted into a rough sinuosity at the inferior edge of the chin; its use is to depress the lower jaw, and open the mouth, and when the jaw is fixed to raise the larynx and pharynx in deglutition.

SECTION XIX.

OF THE LARYNX AND PHARYNX.

Larynx.

Ques. 1. What is the larynx ?

Ans. It is the organ of voice.

Ques. 2. Where is it situated ?

Ans. At the upper and fore part of the neck, at the root of the tongue, just below the os hyoides.

Ques. 3. Of what is it composed ?

Ans. Chiefly of cartilages and ligaments, which when united, form a hollow body permanently open.

Ques. 4. Of how many cartilages does it consist ?

Ans. Five ; namely, the thyroid, the cricoid, the two arytaenoid, and epiglottis.

Ques. 5. Where is the thyroid cartilage ?

Ans. It is placed at the anterior part of the larynx.

Ques. 6. What is its form ?

Ans. It consists of two alæ, which form a projecting angle forward, and then slope backward ; its superior edge has a notch in the middle that may be easily felt, and elevations on each side, and terminates in two cornua posteriorly, which ascend ; its inferior edge is straight, and terminates also in two shorter cornua, which bend downward ; its posterior edges are entirely straight, and on the outer side of each ala a line runs from a small knob near its upper cornu, forward and downward, to terminate in another.

Ques. 7. What is the situation of the cricoid cartilage ?

Ans. It is placed at the lower part of the larynx, its broadest side being backward.

Ques. 8. What is its form ?

Ans. The outer surface of its posterior side has upon it a longitudinal line, and depressions on each side of it, for the attachment of muscles ; the top of the same side slopes downward and outward, terminating in angles, which are smooth for connexion with the arytaenoid cartilages, and from these angles elevated lines descend to terminate in smooth surfaces for the lower cornua of the thyroid cartilage.

Ques. 9. What is the situation of the arytaenoid cartilages ?

Ans. They are placed posteriorly upon the greater side of the cricoid cartilages.

Ques. 10. What is their form ?

Ans. They are somewhat of a pyramidal form, but their posterior side is concave, their anterior convex, their external edge oblique, and their internal one straight ; their bases rest on the cricoid cartilage, with which they have a moveable connexion.

Ques. 11. What is the situation of the epiglottis ?

Ans. It is placed anteriorly above the other cartilages.

Ques. 12. What is its form ?

Ans. It is narrower, but somewhat thick at its base, and its superior part is thin, flat, and flexible, with convex edges, and it is also convex posteriorly, and concave anteriorly.

Ques. 13. What ligaments does the larynx possess ?

Ans. A short ligament connects the body of the os hyoides to the notch of the thyroid cartilage, from which a ligament proceeds to the epiglottis, and another from the epiglottis to the body of the os hyoides, thus leaving behind them a triangular space ; ligaments also connect the cornua of the os hyoides to those of the thyroid cartilage, and the lateral ligaments of the epiglottis are

attached to the tops of the arytaenoid cartilages. The inferior cornua of the thyroid cartilage are likewise connected to the lower articular surfaces of the cricoid by short ligaments, and the inferior edge of the one is also connected to the superior part of the other; the cricoid cartilage is connected by ligaments to the bases of the arytaenoid cartilages above, and to the first ring of the trachea below.

Ques. 14. What is the glottis?

Ans. It is an opening formed between two small ligaments which proceed from the middle of the posterior side of the thyroid cartilage to the bases of the arytaenoid cartilages, and immediately beneath these two other ligaments are placed, the superior and inferior ligaments on each side leave a narrow fissure between them, which is the opening of a small sac.

Ques. 15. What is the use of the larynx?

Ans. It forms the chief part of the organ of voice, and affords a passage permanently open for respiration; it also gives attachment to numerous muscles.

Pharynx.

Ques. 16. What is the pharynx?

Ans. It is a membranous and muscular bag expanded above, contracted below, and terminating in the gullett or œsophagus.

Ques. 17. What is its situation?

Ans. It is placed behind the mouth, nares, and larynx, below the cuneiforme process of the os occipitis, before the cervical vertebræ, and above the œsophagus.

Ques. 18. How is it composed?

Ans. It is composed of circular muscular fibres, and of a membrane copiously supplied with mucous glands.

Ques. 19. Into what portions is it divided?

Ans. It is divided into three portions—a superior, which is called its arch ; a middle, which is its body ; and an inferior, which is its sphincter.

Ques. 20. What is its form ?

Ans. Its upper part is extremely wide, extending almost all the way between the styloid processes ; it then contracts on each side and behind the upper part of the larynx ; again expanding behind the larynx and before the atlas it forms considerable folds.

Ques. 21. What is its use ?

Ans. It is chiefly useful in deglutition, receives the food, and transmits it to the œsophagus.

SECTION XX.

OF THE MUSCLES OF THE ORGANS OF VOICE AND DEGLUTITION.

Ques. 1. How many muscles arise from the cranium and are inserted into the larynx ?

Ans. There are four ; the digastricus, the stylo-hyoideus, mylo-hyoideus, and genio-hyoideus.

[The origin, insertion, and use of the digastricus having already been noticed, it will therefore be passed.]

Ques. 2. What is the origin, insertion, and use of the stylo-hyoideus ?

Ans. It arises from the middle and inferior part of the styloid process ; it is inserted into the lateral and inferior part of the body of the os hyoides, below its middle its fibres separate to allow the passage of the tendon of the digastricus ; its use is to pull the os hyoides upward and to one side.

Ques. 3. What is the origin, insertion, and use of the mylo-hyoideus ?

Ans. It arises from a line on the inside of the lower jaw, between the last dens molaris, and the middle of the chin, where it joins its fellow ; it is inserted into the middle of the base of the os hyoides and its fellow ; its use is to pull the os hyoides forward, upward, and laterally.

Ques. 4. What is the origin, insertion, and use of the genio-hyoideus ?

Ans. It arises from a rough protuberance in the middle of the inside of the chin ; it is inserted into the middle of the upper part of the os hyoides ; its use is to pull the os hyoides forward and upward, and assist in depressing the lower jaw.

Ques. 5. How many muscles arise from the trunk and are inserted into the larynx ?

Ans. Two ; viz., the sterno-hyoideus and sterno-thyroideus.

Ques. 6. Describe the origin, insertion, and use of the sterno-hyoideus ?

Ans. It arises from the junction of the sternum and clavicle, and from the cartilage of the first rib ; it is inserted into the middle of the lower part of the basis of the os hyoides ; its use is to pull the os hyoides downward.

Ques. 7. What is the origin, insertion, and use of the sterno-thyroideus ?

Ans. It arises from the edge of the upper bone of the sternum, opposite the cartilage of the first rib internally ; it is inserted into the rough line, at the external part of the lower edge of the thyroid cartilage ; its use is to pull the thyroid cartilage downward.

Ques. 8. What muscle arises from the shoulder and is inserted into the larynx ?

Ans. The omo-hyoideus.

Ques. 9. What is its origin, insertion, and use ?

Ans. It arises from the semilunar notch of the superior costa of the scapula, ascending upward and forward behind the sterno cleido mastoideus ; it becomes tendinous, and again grows fleshy ; it is inserted into the sides of the lower part of the basis of the os hyoides ; its use is to pull the os hyoides obliquely downward.

Ques. 10. What muscles have both origin and insertion on the larynx ?

Ans. There are nine ; viz., the thyro-hyoideus, musculus glandulæ thyroideæ, crico-thyroideus, cryco-arytænoideus posticus, crico-arytænoideus lateralis, thyro-arytænoideus major, thyro-arytænoideus minor, arythænoideus obliquus, and arythænoideus transversus.

Ques. 11. What is the origin, insertion, and use of the thyro-hyoideus ?

Ans. It arises from a rough line upon the external part of the thyroid cartilage ; it is inserted into part of the basis and all the cornu of the os hyoides externally ; its use is to pull the os hyoides downward, or the thyroid cartilage upward.

Ques. 12. What is the origin, insertion, and use of the musculus glandulæ thyroideæ ?

Ans. It arises from the lower edge of the basis of the os hyoides, and crosses the thyroid cartilage ; it is inserted into the middle of the thyroid gland ; its use is to pull the gland toward the os hyoides.

Ques. 13. What is the origin, insertion, and use of the crico-thyroides ?

Ans. It arises from the anterior and lateral parts of the cricoid cartilage, and runs obliquely upward and outward ; it is inserted by two terminations, one into the base of the thyroid cartilage the other into its inferior cornu ; its use is to pull downward and forward the thyroid, or upward and backward the cricoid.

Ques. 14. What is the origin, insertion, and use of the crico-arytænoideus posticus ?

Ans. It arises from the posterior part of the cricoid cartilage ; it is inserted posteriorly into the base of the arytenoid ; its use is to pull back the arytenoid cartilages, and to open the rima glottidis.

Ques. 15. What is the origin, insertion, and use of the crico-arytænoideus lateralis ?

Ans. It arises from the side of the cricoid cartilage, where it is covered by the thyroid ; it is inserted into the side of the base of the arytenoid ; its use is to open the rima glottidis.

Ques. 16. What is the origin, insertion, and use of the thyro-arytænoideus major ?

Ans. It arises from the inferior and posterior part of the body of the thyroid cartilage, running upward and backward, along the side of the glottis. It is inserted into the arytenoid cartilage above and before the crico-arytænoideus laterales ; its use is to pull forward the arytenoid towards the middle of the thyroid, and to relax the glottis.

Ques. 17. What is the origin, insertion, and use of the thyro-arytænoideus minor ?

Ans. It arises from the thyroid cartilage, near its incisura cordiformis ; it is inserted into the arytenoid cartilage ; its use is the same as that of the thyro-arytænoideus major.

Ques. 18. What is the origin, insertion, and use of the arytenoideus obliquus ?

Ans. It arises from the base of one arytaenoid cartilage, and crosses its fellow; it is inserted into the tip of the other arytaenoid cartilage; its use is to approximate the arytaenoid cartilages.

Ques. 19. What muscle arises from one arytaenoid cartilage, and is inserted into the other?

Ans. The arytaenoideus transversus.

Ques. 20. What is its origin, insertion, and use?

Ans. It arises from the side of one arytaenoid cartilage, and is inserted into the other side of the other arytaenoid cartilage; its use is to shut the rima glottidis.

Ques. 21. What muscles arise from the cranium, and are inserted into the tongue?

Ans. There are two, viz., the genio-glossus and stylo-glossus.

Ques. 22. What is the origin, insertion, and use of the genio-glossus?

Ans. It arises from a rough point on the inside of the middle of the chin, and its fibres run forward, upward, and backward; it is inserted into the tip, middle, and root of the tongue, slightly also into the base of the os hyoides, laterally; its use is to draw the tip of the tongue back, its middle down, or to make its dorsum concave; to draw also the os hyoides forward, and to thrust the tongue out of the mouth.

Ques. 23. What is the origin, insertion, and use of the stylo-glossus?

Ans. It arises from the styloid process, and the lateral ligaments of the lower jaw; it is inserted into the root and sides of the tongue; its use is to pull it aside, and backward.

Ques. 24. What muscle arises from the os hyoides, and is inserted into the tongue?

Ans. The hyo-glossus.

Ques. 25. What is its origin, insertion, and use?

Ans. It arises from the base, cornu, and appendix of

the os hyoides ; it is inserted into the side of the tongue ; its use is to pull the tongue inward and downward.

Ques. 26. What muscle is wholly situated in the tongue ?

Ans. The lingualis.

Ques. 27. What is its origin, insertion, and use ?

Ans. It arises from the side of the root of the tongue, and runs forward between the hyo and genio-glossus ; it is inserted into the tip of the tongue ; its use is to contract the tongue in its length.

Ques. 28. How many muscles arise from the cranium and are inserted into the palate ?

Ans. There are two, viz., the circumflexus or tensor palati, and levator palati.

Ques. 29. What is the origin, insertion, and use of the circumflexus or tensor palati ?

Ans. It arises from the styloid process of the sphæ-noid bone and from the osseous part of the eustachian tube, it runs down along the pterygoideus internus, passes over the hook of the internal pterygoid process, and spreads into a broad membrane ; it is inserted into the velum pendulum palati, and the semilunar edge of the palate bone ; its posterior fibres sometimes join the constrictor pharyngeus superior and palato pharyngeus ; its use is to draw the velum downward, and to stretch it laterally.

Ques. 30. What is the origin, insertion, and use of the levator palati ?

Ans. It arises from the extremity of the petrous portion of the temporal bone, and from the membranous part of the eustachian tube ; it is inserted into the velum pendulum palati as far as the uvula ; its use is to draw the velum upward and backward, and so shut the passage from the fauces to the nose.

Ques. 31. How many muscles arise from the larynx and are inserted into the epiglottis ?

Ans. Three; viz., the thyro-epiglottideus major, thyro-epiglottideus minor, and aryæno-epiglottideus.

Ques. 32. What is the origin, insertion, and use of the thyro-epiglottideus major?

Ans. It arises by a few fibres from the thyroid cartilage; it is inserted into the epiglottis laterally; its use is to draw downward and to expand the epiglottis.

Ques. 33. What is the origin, insertion, and use of the thyro-epiglottideus minor?

Ans. It arises just above the thyro-epiglottideus major; it is inserted into the side of the epiglottis above its root; its use is to draw downward, and to expand the epiglottis.

Ques. 34. What is the origin, insertion, and use of the aryæno-epiglottideus?

Ans. It arises from the lateral and upper part of the aryænoid cartilage; it runs along the outside of the external rima; it is inserted into the epiglottis along with the thyro-epiglottideus minor; its use is to pull the epiglottis upon the rima.

Ques. 35. What muscle arises from the cranium and is inserted into the uvula?

Ans. The azygos uvulæ.

Ques. 36. What is its origin, insertion, and use?

Ans. It arises from the extremity of the suture of the palate bones, and runs down the velum and uvula; it is inserted into the tip of the uvula; its use is to elevate the uvula.

Ques. 37. What muscle arises from the tongue, and is inserted into the fauces?

Ans. The constrictor isthmi faucium.

Ques. 38. What is its origin, insertion, and use?

Ans. It arises from the side of the tongue near its root, and runs upwards within the anterior arch, before the amygdala; it is inserted anteriorly into the middle of the velum at the root of the uvula, being there connected with

its fellow and with the palato-pharyngeus ; its use is to pull the velum and the root of the tongue toward each other, so contracting the passage between the two arches and shutting the opening into the fauces.

Ques. 39. How many muscles arise from the cranium and are inserted into the pharynx ?

Ans. There are two ; the stylo-pharyngeus and constrictor pharyngis superior.

Ques. 40. What is the origin, insertion, and use of the stylo-pharyngeus ?

Ans. It arises from the root of the styloid process ; it is inserted into the side of the pharynx, and back of the thyroid cartilage ; its use is to dilate and to elevate the pharynx and thyroid cartilage.

Ques. 41. What is the origin, insertion, and use of the constrictor pharyngis superior ?

Ans. It arises from the cuneiforme process of the os occipitis, near the anterior condyloid foramina ; from the pterygoid process of the sphœnoid bones ; from the upper and under jaw, near the dentes sapientitæ, being connected at this point with the buccinator, and with fibres from the tongue and palate ; it is inserted into a white line in the middle of the posterior part of the pharynx, being covered by the constrictor medius ; its use is to compress the upper part of the pharynx and to draw it upward and forward.

Ques. 42. How many muscles arise from the larynx and are inserted into the pharynx ?

Ans. There are two ; the constrictor pharyngis medius, and constrictor pharyngis inferior.

Ques. 43. What is the origin, insertion, and use of the constrictor pharyngis medius ?

Ans. It arises from the appendix and cornu of the os hyoides, and from the ligament connecting it to the thyroid cartilage ; it is inserted into the white line on the back of the pharynx, its upper fibres being connected to the cu-

neiforme process of the occipital bone ; its use is to compress the pharynx, and to draw it and the os hyoides upward.

Ques. 44. What is the origin, insertion, and use of the constrictor pharyngis inferior ?

Ans. It arises laterally from the thyroid cartilage near the attachment of the sterno, and thyro-hyoidei ; also from the cricoid cartilage, near the crico-thyroideus, being the largest of the three constrictors ; it is inserted into the white line on the back of the pharynx ; its superior fibres covering half the constrictor medius, and its inferior the commencement of the œsophagus ; its use is to compress the pharynx, and to raise it and the larynx upward.

Ques. 45. What is the origin, insertion, and use of the palato-pharyngeus ?

Ans. It arises posteriorly from the middle of the velum pendulum palati at the root of the uvula, and also from the tendinous expansion of the tensor palati, passing behind the amygdala and within the posterior arch, its fibres run back to the sides and upper part of the pharynx ; it is inserted into the posterior and upper edge of the thyroid cartilage, and between the inferior constrictors and the pharynx ; its use is powerfully to contract the fauces.

SECTION XXI.

MUSCLES OF THE UPPER EXTREMITY.

Ques. 1. How many muscles arise from the trunk and are inserted into the shoulder?

Ans. Six; viz., the pectoralis minor, angularis scapulæ, trapezius, rhomboideus, serratus magnus, and subclavius.

Ques. 2. Describe the origin, insertion, and use of the pectoralis minor.

Ans. It arises tendinous and fleshy from the upper edge of the third, fourth, and fifth ribs, near their cartilages; it is inserted by a short tendon into the coracoid process of the scapula; its use is to pull the scapula forward and downward.

Ques. 3. Describe the origin, insertion, and use of the angularis scapulæ.

Ans. It arises from the transverse processes of the five superior vertebræ of the neck; it is inserted into the superior angle of the scapula; its use is to elevate the base of the scapula.

Ques. 4. What is the origin, insertion, and use of the trapezius?

Ans. It arises from the spine and transverse ridge of the occiput, the ligamentum nuchæ, the spinous processes of the two inferior vertebræ of the neck, and from all those of the back; it is inserted into the posterior half of the clavicle, the acromion, and almost all the spina scapulæ; its use is to pull the scapula upward and backward, or backward and downward.

Ques. 5. What is the origin, insertion, and use of the rhomboideus?

Ans. It arises from the spinous processes of the three inferior vertebræ of the neck, the ligamentum nuchæ, and the five superior of the back; it is inserted into all the base of the scapula; its use is to draw the scapula inward and upward.

Ques. 6. What is the origin, insertion, and use of the serratus magnus?

Ans. It arises from the nine superior ribs, by as many digitations; it is inserted into all the inner edge of the base and angles of the scapula; its use is to pull the scapula forward.

Ques. 7. What is the origin, insertion, and use of the subclavius?

Ans. It arises from the cartilage of the first rib; it is inserted into almost all the inferior side of the clavicle; its use is to pull the clavicle downward.

Ques. 8. How many muscles arise from the trunk, and are inserted into the humerus?

Ans. There are two, viz., the pectoralis major and latissimus dorsi.

Ques. 9. What is the origin, insertion, and use of the pectoralis major.

Ans. It arises from the cartilages of the fifth and sixth ribs, where its fibres mix with those of the obliquus externus abdominis, from almost all the length of the sternum, and from more than half the anterior edge of the clavicle; it is inserted by two broad tendons, which cross each other into the outer ridge of the bicipital groove; its use is to move the arm upward and inward.

Ques. 10. What is the origin, insertion, and use of the latissimus dorsi?

Ans. It arises from the posterior part of the crista ilii, from all the sacral and lumbar vertebral spines, and from the seven inferior dorsal, and by digitations from three or four of the inferior ribs; passing over the inferior angle of the scapula, it turns before the teres major; it is in-

served into the inner edge of the bicipital groove ; its use is to pull the arm backward and downward, and to rotate the humerus.

Ques. 11. How many muscles arise from the scapula, and are inserted into the humerus ?

Ans. Seven, viz., the *deltoïdes*, *coraco-brachialis*, *supra-spinatus*, *infra-spinatus*, *teres minor*, *teres major*, and *subscapularis*.

Ques. 12. What is the origin, insertion, and use of the deltoid muscle ?

Ans. It arises from that anterior portion of the clavicle which is unoccupied by the *pectoralis major*, from the acromion, and inferior edge of the *spina scapulæ* ; it is inserted into an extensive roughness on the middle of the outside of the humerus ; its use is to pull the arm upward and forward, directly upward, or upward and backward.

Ques. 13. What is the origin, insertion, and use of the *coraco-brachialis* ?

Ans. It arises from the tip of the *processus coracoïdes*, adhering to the short head of the *biceps* ; it is inserted into the middle of the internal part of the humerus ; its use is to raise the arm, and move it forward.

Ques. 14. What is the origin, insertion, and use of the *supra-spinatus* ?

Ans. It arises from all the *supra-spinal fossa* of the scapula,—passing under the acromion, it adheres to the capsular ligament of the shoulder ; it is inserted into the superior depression of the tuberosity on the outside of the bicipital groove ; its use is to raise the arm and the capsular ligaments.

Ques. 15. What is the origin, insertion, and use of the *infra-spinatus* ?

Ans. It arises from all the *infra-spinal fossa scapulæ*, and adheres to the capsular ligament ; it is inserted into the middle depression of the same tuberosity ; its use is to raise the humerus, and to rotate it outward.

Ques. 16. What is the origin, insertion, and use of the *teres minor*?

Ans. It arises from the *costa inferior scapulæ*, and adheres to the capsular ligament; it is inserted into the inferior depression of the same tuberosity; its use is to draw the humerus backward, and to rotate it outward.

Ques. 17. What is the origin, insertion, and use of the *teres major*?

Ans. It arises from the outside of the inferior angle of the scapula, and adheres to the capsular ligament; it is inserted into the inner edge of the bicipital groove; its use is to draw the humerus backward, and to rotate it inward.

Ques. 18. What is the origin, insertion, and use of the *sub-scapularis*?

Ans. It arises from all the inside of the scapula, and adheres to the capsular ligament; it is inserted into the internal tuberosity, at the head of the humerus; its use is to rotate the humerus inwards, and to bring it to the side of the body.

Ques. 19. How many muscles arise from the shoulder, and are inserted into the forearm?

Ans. There are two, viz., the *biceps cubiti*, and the long head of the *triceps*.

Ques. 20. What is the origin, insertion, and use of the *biceps cubiti*?

Ans. It arises by two heads, one from the superior margin of the glenoid cavity; it passes through the capsular ligament of the shoulder, over the head of the humerus, and through the groove between the tuberosities; the other or short head arises conjoined with the *coracobrachialis*, from the *coracoides scapulæ*; both heads unite at the middle of the humerus: it is inserted into the tuberosity on the inner side of the upper end of the radius; its use is to supinate the hand, to bend the forearm, and to raise the arm.

Ques. 21. What is the origin, insertion, and use of the long head of the triceps ?

Ans. It arises from the inferior costa scapulæ, near its cervix ; it is inserted into the olecranon of the ulna ; its use is to extend the fore arm, and to carry the arm backward.

Ques. 22. How many muscles arise from the humerus, and are inserted into the forearm ?

Ans. There are six, viz., the shorter heads of the triceps, the anconeus, brachialis internus, supinator radii longus, supinator radii brevis, and pronator radii teres.

Ques. 23. What is the origin, insertion, and use of the shorter heads of the triceps ?

Ans. The second or most external arises from the back of the humerus, near its upper end,—and the third, which is the shortest, from the back of the humerus lower down, and from the intermuscular ligament ; they form one muscle with the long head, and their common insertion is into the olecranon ulnæ ; the use of the triceps is to extend the forearm.

Ques. 24. What is the origin, insertion, and use of the anconeus ?

Ans. It arises from the posterior part of the external condyle of the humerus ; it is inserted into a ridge on the outer and posterior part of the upper end of the ulna ; its use is to extend the forearm.

Ques. 25. What is the origin, insertion, and use of the brachialis internus ?

Ans. It arises from the middle of the os humeri, around the insertion of the deltoid, and from the intermuscular ligament, passing over the capsular ligament of the elbow joint ; it is inserted into the coronoid process of the ulna ; its use is to bend the forearm, and to pull upward the capsular ligament.

Ques. 26. What is the origin, insertion, and use of the supinator radii longus ?

Ans. It arises from the ridge above the external condyle of the os humeri, as far up as the middle of the bone ; it is inserted into the outer side of the inferior end of the radius ; its use is to bend the elbow joint, and to supinate the hand.

Ques. 27. What is the origin, insertion, and use of the supinator radii brevis ?

Ans. It arises from the external condyle of the os humeri, and from the external upper part of the ulna, adhering to the capsular ligament ; it is inserted into the neck and tubercle of the radius, and into the ridge running from that downward and outward ; its use is to supinate the hand.

Ques. 28. What is the origin, insertion, and use of the pronator radii teres ?

Ans. It arises from the internal condyle of the humerus, and likewise from the coronoid process of the ulna ; it is inserted into the middle of the outside of the radius ; its use is to pronate the hand.

Ques. 29. How many muscles arise from the humerus, and are inserted into the hand ?

Ans. Six ; viz., the flexor carpi ulnaris, palmaris longus, flexor carpi radialis, extensor carpi radialis longior, extensor carpi radialis brevior, and extensor carpi ulnaris.

Ques. 30. What is the origin, insertion, and use of the flexor carpi ulnaris ?

Ans. It arises from the inner condyle of the humerus, the outer side of the olecranon, and the fascia of the forearm ; it is inserted into the os pisiforme, and metacarpal bone of the little finger ; its use is to bend the arm and wrist joints.

Ques. 31. What is the origin, insertion, and use of the palmaris longus ?

Ans. It arises from the inner condyle of the humerus ; it is inserted into the carpal ligament, and aponeurosis palmaris ; its use is to bend the wrist, and to stretch the aponeurosis.

Ques. 32. What is the origin, insertion, and use of the flexor carpi radialis ?

Ans. It arises from the inner condyle of the humerus, and from the upper end of the ulna anteriorly ; adhering to the capsular ligament, it is inserted anteriorly into the upper end of the metacarpal bone of the fore finger, having passed through a groove of the trapezium ; its use is to bend the wrist and elbow joints.

Ques. 33. What is the origin, insertion, and use of the extensor carpi radialis longior ?

Ans. It arises from the lower part of the external ridge of the humerus, above its external condyle ; it is inserted posteriorly into the upper end of the metacarpal bone of the fore finger ; its use is to extend the wrist joint and occasionally to bend the elbow joint.

Ques. 34. What is the origin, insertion, and use of the extensor carpi radialis brevior ?

Ans. It arises from the external condyle of the humerus, and from the external lateral ligament of the elbow joint ; it is inserted posteriorly into the upper part of the metacarpal bones of the fore and middle fingers ; its use is to extend the wrist joint.

Ques. 35. What is the origin, insertion, and use of the extensor carpi ulnaris ?

Ans. It arises from the external condyle of the humerus, and from the middle of the ulna through the groove, at the extremity of which it passes ; it is inserted posteriorly into the upper end of the metacarpal bone of the little finger ; its use is to extend the wrist joint.

Ques. 36. How many muscles arise from the humerus and are inserted into the fingers ?

Ans. There are three, viz., the flexor digitorum sublimis perforatus, flexor longus pollicis, and extensor digitorum communis.

Ques. 37. What is the origin, insertion, and use of the flexor digitorum sublimis perforatus ?

Ans. It arises from the inner condyle of the humerus, the coronoid process of the ulna, the tuberosity of the radius, and the middle of the fore part of the radius; it sends off four tendons; it is inserted anteriorly into the upper end of all the bones of the second phalanx, dividing near the ends of the first for the passage of the tendons of the perforans; its use is to bend the first and second joints of the fingers, the wrist and elbow joint.

Ques. 38. What is the origin, insertion, and use of the flexor longus pollicis?

Ans. It arises from the inner condyle of the humerus, and from the anterior side of the radius below the tuberosity; it is inserted into the last bone of the thumb; its use is to bend the last bone of the thumb, and also the wrist joint.

Ques. 39. What is the origin, insertion, and use of the extensor digitorum communis?

Ans. It arises from the external condyle of the humerus, adhering to the supinator brevis; it divides into four tendons, which are connected by small transverse ones upon the back of the hand; it is inserted into the posterior part of all the bones of the fingers; its use is to extend all the joints of the fingers, the wrist and the elbow joint.

Ques. 40. What muscle arises from the ulna and interosseous ligament and is inserted into the phalanges of the fingers?

Ans. The flexor digitorum profundus perforans.

Ques. 41. What is its origin, insertion, and use?

Ans. It arises from the upper, anterior, and outer part of the ulna, and from part of the interosseous ligament; it is inserted, after passing behind the flexor sublimis and annular ligament (its tendons perforating those of the above named muscles), anteriorly into the root of the last bone of each finger; its use is to bend the joints of the fingers and the wrist joint.

Ques. 42. What muscles arise from the tendons of the flexor profundus and are inserted into the phalanges of the fingers ?

Ans. The lumbricales ; they are four in number.

Ques. 43. What is their origin, insertion, and use ?

Ans. They arise from the outside of the tendons of the flexor profundus ; they are inserted into the inside of the first joint of the finger, and into the back of each of the other joints ; their use is to adduct these fingers, to bend their first joint, and to extend the rest.

Ques. 44. How many muscles arise from the forearm, and are inserted into the fingers ?

Ans. There are five ; viz., the extensor ossis metacarpi pollicis, extensor primi internodii pollicis, extensor secundi internodii pollicis, flexor longus pollicis, and indicator.

Ques. 45. What is the origin, insertion, and use of the extensor ossis metacarpi pollicis ?

Ans. It arises posteriorly from the middle of the ulna, from the middle of the radius, and from the interosseous ligament ; it is inserted into the trapezium and metacarpal bone of the thumb ; its use is to extend the wrist joint and the metacarpal bone of the thumb.

Ques. 46. What is the origin, insertion, and use of the extensor primi internodii pollicis ?

Ans. It arises from the posterior part of the ulna and the interosseous ligament ; it is inserted into the back of the first and second bones of the thumb ; its use is to extend the wrist, the metacarpal and first bone of the thumb.

Ques. 47. What is the origin, insertion, and use of the extensor secundi internodii pollicis ?

Ans. It arises posteriorly from the middle of the ulna and from the interosseous ligament, and its tendon passes through a groove at the lower end of the radius ; it is inserted into the last bone of the thumb ; its use is to extend the wrist and the last joint of the thumb.

[The flexor longus pollicis has already been noticed in Question and Answer No. 38.]

Ques. 48. What is the origin, insertion, and use of the indicator?

Ans. It arises posteriorly from the middle of the ulna; it is inserted into the posterior part of the fore-finger; its use is to extend the fore-finger.

Ques. 49. What muscle arises from the ulna and is inserted into the radius?

Ans. The pronator quadratus.

Ques. 50. What is its origin, insertion, and use?

Ans. It arises from the lower and inner part of the ulna: it is inserted into the lower and anterior part of the radius; its use is to pronate the hand.

Ques. 51. What muscle arises from the wrist and is inserted into the integuments of the hand?

Ans. The palmaris brevis.

Ques. 52. What is its origin, insertion, and use?

Ans. It arises from the aponeurosis palmaris and ligamentum annulare; it is inserted into the os pisiforme, and into the integuments covering the abductor minimi digiti; its use is to aid in contracting the palm.

Ques. 53. How many muscles arise from the wrist and are inserted into the thumb?

Ans. There are three; viz., the abductor pollicis, flexor ossis metacarpi pollicis, and flexor brevis pollicis.

Ques. 54. What is the origin, insertion, and use of the abductor pollicis?

Ans. It arises from the annular ligament and os trapezium; it is inserted into the outside of the root of the first bone of the thumb; its use is to draw the thumb toward the finger.

Ques. 55. What is the origin, insertion, and use of the flexor ossis metacarpi pollicis?

Ans. It arises from the trapezium and annular ligament lying under the abductor; it is inserted anteriorly into the

lower end of the metacarpal bone of the thumb ; its use is to draw the thumb toward the finger.

Ques. 56. What is the origin, insertion, and use of the flexor brevis pollicis ?

Ans. It arises from the trapezoides magnum and unciforme of the carpus, being divided by the flexor longus ; it is inserted into the ossa sessamoidea and first bone of the thumb ; its use is to bend the first joint of the thumb.

Ques. 57. What muscle arises from the wrist and is inserted into the fore finger ?

Ans. The abductor indicis.

Ques. 58. What is its origin, insertion, and use ?

Ans. It arises from the trapezium, and from the inside of the metacarpal bone of the thumb ; it is inserted into the outward and back part of the first bone of the index ; its use is to approximate the thumb and fore finger ?

Ques. 59. How many muscles arise from the wrist, and are inserted into the little finger ?

Ans. There are three, viz., the abductor minimi digiti manus, abducti metacarpi minimi digiti, and flexor parvus minimi digiti.

Ques. 60. What is the origin, insertion, and use of the abductor minimi digiti manus ?

Ans. It arises from the os pisiforme and annular ligament ; it is inserted into the outer side of the upper end of the first bone of the little finger ; its use is to draw this finger from the rest.

Ques. 61. What is the origin, insertion, and use of the adductor metacarpi minimi digiti ?

Ans. It arises from the process of the unciforme, and from the annular ligament ; it is inserted into the inside and anterior part of the metacarpal bone of the little finger ; its use is to draw the metacarpal bone of this finger toward the rest.

Ques. 62. What is the origin, insertion, and use of the flexor parvus minimi digiti ?

Ans. It arises from the outside of the os unciforme and annular ligament; it is inserted into the inner and anterior part of the upper end of the first bone of the little finger; its use is to bend the first joint and assist the abductor.

Ques. 63. What muscle arises from the metacarpus, and is inserted into the thumb?

Ans. The adductor pollicis.

Ques. 64. What is its origin, insertion, and use?

Ans. It arises from all the length of the metacarpal bone of the middle finger; it is inserted into the inner part of the root of the first bone of the thumb; its use is to draw the thumb toward the fingers.

Ques. 65. How many muscles arise from the metacarpus, and are inserted into the fingers?

Ans. Seven, viz., the prior indicis, posterior indicis, prior medii, posterior medii, prior annularius, posterior annularius, and interosseous auricularis.

Ques. 66. What is the origin, insertion, and use of the prior indicis?

Ans. It arises from the upper anterior part of the metacarpal bone of the fore finger; it is inserted into all the posterior part of the fore finger; its use is to abduct the fore finger, to bend the first joint, and to extend the rest.

Ques. 67. What is the origin, insertion, and use of the posterior indices?

Ans. It arises from the root and inner part of the metacarpal bone of the fore finger; it is inserted into all the posterior part of the fore finger; its use is to abduct the fore finger, to bend the first joint, and to extend the rest.

Ques. 68. What is the origin, insertion, and use of the prior medii?

Ans. It arises from the roots of the metacarpal bones of the fore and middle fingers; it is inserted into all the posterior part of the middle finger; its use is to draw the middle finger towards the thumb, to bend the first, and to extend its other joints.

Ques. 69. What is the origin, insertion, and use of the posterior medii ?

Ans. It arises from the roots of the metacarpal bones that sustain the middle and ring fingers ; it is inserted into all the posterior part of the middle finger ; its use is to draw the middle finger outward, to bend its first and extend its other joints.

Ques. 70. What is the origin, insertion, and use of the prior annularis ?

Ans. It arises from the anterior part of the root of the metacarpal bone of the ring finger ; it is inserted into all the posterior part of the ring finger ; its use is to abduct the ring finger, to bend its first, and to extend its other joints.

Ques. 71. What is the origin, insertion, and use of the posterior annularis ?

Ans. It arises from the roots of the metacarpal bones of the ring and little fingers ; it is inserted into all the posterior part of the ring finger ; its use is to abduct the ring finger, to bend its first, and to extend its other joints.

Ques. 72. What is the origin, insertion, and use of the interosseous auricularis ?

Ans. It arises from the anterior part of the root of the metacarpal bone of the little finger ; it is inserted into all the posterior part of the little finger ; its use is to abduct the little finger, to bend its first, and to extend its other joints.

SECTION XXII.

MUSCLES OF THE LOWER EXTREMITY.

Ques. 1. What muscle arises from the trunk, and is inserted into the femur ?

Ans. The *psoas magnus*.

Ques. 2. What is its origin, insertion, and use ?

Ans. It arises from the side of the body and transverse process of the last vertebra of the back, and from the same parts of all the lumbar vertebræ ; it is inserted into all the trochanter minor of the femur, and some way below it ; its use is to bend the thigh, or the lumbar vertebræ upon the pelvis.

Ques. 3. How many muscles arise from the pelvis, and are inserted into the femur ?

Ans. Thirteen, viz., the *gluteus maximus*, *gluteus medius*, *gluteus minimus*, *pyriformis*, *obturator internus*, *gemini*, *quadratus femoris*, *iliacus internus*, *pectinalis*, *obturator externus*, *adductor longus femoris*, *adductor brevis femoris*, and *adductor magnus femoris*.

Ques. 4. What is the origin, insertion, and use of the *gluteus maximus* ?

Ans. It arises from the posterior part of the *crista ilii*, from the side of the sacrum below its junction with the ilium, from the posterior sacro-ischiatic ligament, and from the *os coccygis* : it passes over the posterior part of the trochanter major, and is connected to the fascia of the thigh ; it is inserted into the upper and outer part of the *linea aspera* ; its use is to extend the thigh.

Ques. 5. What is the origin, insertion, and use of the *gluteus medius*?

Ans. It arises from the anterior superior spinous process of the ilium, anteriorly from the outer edge of the spine of the ilium, and posteriorly from the dorsum of that bone; it is inserted into the middle great depression of the trochanter major; its use is to pull the femur outward and backward, and when bended, to rotate it outward.

Ques. 6. What is the origin, insertion, and use of the *gluteus minimus*?

Ans. It arises from a ridge extending from below the superior anterior spinous process of the ilium to its great notch; it is inserted into the anterior great depression of the trochanter major; its use is to pull the femur outward and backward, and to rotate it outward.

Ques. 7. What is the origin, insertion, and use of the *pyriformis*?

Ans. It arises internally from the second, third, and fourth false vertebræ,—passing out of the pelvis it receives some fibres from the posterior inferior spine of the ilium; it is inserted into the anterior small depression on the top of the trochanter major; its use is to aid in moving the thigh upward, and rolling it outwards.

Ques. 8. What is the origin, insertion, and use of the *obturator internus*?

Ans. It arises from almost all the internal circumference of the obturator foramen,—it passes out of the pelvis between the tuber ischii, and the posterior sacro-ischiatic ligament,—passing also over the capsular ligament of the hip joint, it is sheathed by the *gemini*; it is inserted into the posterior small depression on the top of the trochanter major; its use is to roll the femur obliquely outward.

Ques. 9. What is the origin, insertion, and use of the *gemini*?

Ans. They arise, the superior from the spine, and the inferior from the tuberosity of the ischium, and in their

course they form a sheath for the obturator internus ; they are inserted into the posterior part of the top of the trochanter major on each side of the obturator internus ; their use is to roll the thigh outward, and to retain the tendon of the obturator.

Ques. 10. What is the origin, insertion, and use of the quadratus femoris ?

Ans. It arises from the outer edge of the tuber ischii ; it is inserted posteriorly into a ridge between the great and small trochanters ; its use is to roll the thigh outward.

Ques. 11. What is the origin, insertion, and use of iliacus internus ?

Ans. It arises from all the inner lip of the spine of the os ilium, from most of the hollow part of the ilium, and also from the transverse process of the last lumbar vertebra ; it is inserted into the trochanter minor ; its use is to bend the thigh ?

Ques. 12. What is the origin, insertion, and use of the pectinalis ?

Ans. It arises from all the upper and anterior part of the os pubis ; it is inserted into the anterior upper part of the linea aspera ; its use is to bring the thigh upward and inward, and to rotate it in some degree outward.

Ques. 13. What is the origin, insertion, and use of the obturator externus ?

Ans. It arises from the inferior anterior part of the pubis, from the forepart of the crus of the ischium, and from the external margin of the obturator foramen ; it is inserted into the cavity behind the trochanter major, adhering to the capsula ligament ; its use is to roll the femur outward, and to prevent the capsular ligament from being pinched.

Ques. 14. What is the origin, insertion, and use of the adductor longus femoris ?

Ans. It arises from the superior anterior part of the os pubis, and from its symphysis internally to the pectinalis ; it is inserted near the middle of the linea aspera ; its

use is to pull the femur inward and upward, and in some degree to rotate it outward.

Ques. 15. What is the origin, insertion, and use of the adductor brevis femoris?

Ans. It arises from the pubis near its symphysis, below and behind the adductor longus femoris; it is inserted into the upper part of the linea aspera, above the insertion of the adductor longus femoris; its use is similar to that of the adductor longus femoris.

Ques. 16. What is the origin, insertion, and use of the adductor magnus femoris?

Ans. It arises near the symphysis, more inferiorly than the adductor brevis, and from the tuber ischii; it is inserted into almost all the length of the linea aspera, into the ridge leading from that to the internal condyle, and into the condyle itself; its use is to pull the femur inward and upward, and in some degree to rotate it outward.

Ques. 17. What muscle arises from the pelvis and is inserted into the fascia of the thigh?

Ans. The tensor vaginæ femoris.

Ques. 18. What is its origin, insertion, and use?

Ans. It arises externally from the anterior superior spinous process of the ilium; it is inserted a little below the trochanter major into the inside of the fascia of the thigh; its use is to stretch the fascia, to abduct the thigh, and rotate it outward.

Ques. 19. How many muscles arise from the pelvis and are inserted into the leg?

Ans. There are six, viz., the rectus cruris, sartorius, gracilis, semitendinosus, semimembranosus, and the long head of the biceps.

Ques. 20. What is the origin, insertion, and use of the rectus cruris?

Ans. It arises from the inferior anterior spine of the ilium, and from the dorsum of the same bone; it is inserted

into the patella, and subsequently into the anterior tuberosity of the tibia ; its use is to bend the thigh and to extend the leg.

Ques. 21. What is the origin, insertion, and use of the sartorius ?

Ans. It arises from the anterior superior spine of the ilium, and passes inwardly ; it is inserted into the inner anterior side of the upper end of the tibia ; its use is to elevate the thigh and to turn it outward, and to bend the leg inwardly.

Ques. 22. What is the origin, insertion, and use of the gracilis ?

Ans. It arises from the symphysis pubis ; it is inserted into the tibia, behind the sartorius ; its use is to adduct the femur and to bend the knee.

Ques. 23. What is the origin, insertion, and use of the semitendinosus ?

Ans. It arises, conjoined with the long head of the biceps, from the upper part of the tuber ischii ; it is inserted into the tibia, behind the sartorius ; its use is to extend the thigh and bend the leg.

Ques. 24. What is the origin, insertion, and use of the semimembranosus ?

Ans. It arises from the upper part of the tuber ischii ; it is inserted into the inner and back part of the head of the tibia ; its use is to extend the thigh and to bend the leg.

Ques. 25. What is the origin, insertion, and use of the long head of the biceps ?

Ans. It arises conjointly with the semitendinosus from the upper part of the tuber ischii ; it is inserted into the top of the head of the fibula ; its use is to extend the thigh and bend the leg.

Ques. 26. How many muscles arise from the femur, and are inserted into the leg ?

Ans. There are five, viz., the cruralis, vastus externus, vastus internus, the short head of the biceps, and popliteus.

Ques. 27. What is the origin, insertion, and use of the cruralis ?

Ans. It arises from between the two trochanters of the femur, and is connected to the femur downward, and to both vasti ; it is inserted into the upper part of the patella, and by means of its ligament into the tuberosity of the tibia ; its use is to extend the leg.

Ques. 28. What is the origin, insertion, and use of the vastus externus ?

Ans. It arises from the root of the trochanter major and whole length of the linea aspera ; it is inserted similarly to the cruralis, but more externally ; its use is to extend the leg.

Ques. 29. What is the origin, insertion, and use of the vastus internus ?

Ans. It arises from between the root of the trochanter minor and anterior part of the femur, and from all the length of the linea aspera ; it is inserted like the cruralis, but more internally ; its use is to extend the leg.

Ques. 30. What is the origin, insertion, and use of the short head of the biceps ?

Ans. It arises from the linea aspera, below the insertion of the gluteus maximus ; it is inserted into the top of the head of the fibula ; its use is to bend the leg.

Ques. 31. What is the origin, insertion, and use of the popliteus ?

Ans. It arises from the inferior and posterior part of the external condyle of the femur, adhering to the capsular ligament ; it is inserted into a ridge at the upper and internal part of the tibia ; its use is to bend the leg, and prevent the capsular ligament from being pinched.

Ques. 32. How many muscles arise from the femur, and are inserted into the foot ?

Ans. There are two : the gastrocnemius, and plantaris.

Ques. 33. What is the origin, insertion, and use of the gastrocnemius ?

Ans. It arises by two heads, one from the superior and posterior part of the internal condyle of the femur, the other from the same part of the external; it is inserted into the tendon of the soleus; its use is to bend the knee and to aid the soleus.

Ques. 34. What is the origin, insertion, and use of the plantaris?

Ans. It arises from the upper and back part of the root of the external condyle of the femur, adhering to the capsular ligament of the knee joint in its descent; it is inserted into the inside of the posterior part of the os calcis, below the tendo-Achillis; its use is to aid in bending the knee and in extending the foot, and to prevent the capsular ligament from being pinched.

Ques. 35. How many muscles arise from the leg and are inserted into the foot?

Ans. Six; viz., the soleus, tibialis posticus, peroneus longus, peroneus brevis, tibialis anticus, and peroneus tertius or nonus vesalii.

Ques. 36. What is the origin, insertion, and use of the soleus?

Ans. It arises from the posterior part of the head of the fibula, from that bone somewhat downward, and also from the posterior and middle part of the upper end of the tibia, and from the same bone more internally; it is inserted by its tendon (the tendo-Achillis) into the posterior part of the os calcis; its use is to extend the foot.

Ques. 37. What is the origin, insertion, and use of the tibialis posticus?

Ans. It arises from the anterior and upper part of the tibia, and (passing through the interosseous ligament) from the back of the fibula, from a great portion of the back of the tibia superiorly, and from the interosseous ligament; its tendon passes in a groove behind the malleolus internus; it is inserted into the upper and inner part of the os naviculare, thence into the cuneiforme internum

and medium ; its use is to extend the foot, and to turn the toes inward.

Ques. 38. What is the origin, insertion, and use of the *peroneus longus* ?

Ans. It arises anteriorly from the head, and externally from the body of the fibula, almost as far down as the ankle, its tendon passing through a groove in the posterior part of the lower end of the fibula on the outside of the *os calcis*, and on the inferior part of the *os cuboides* ; it is inserted into the *os cuneiforme internum*, and into the outside of the root of the metatarsal bone of the great toe ; its use is to extend and to move the foot outward.

Ques. 39. What is the origin, insertion, and use of the *peroneus brevis* ?

Ans. It arises from above the middle of the external part of the fibula ; it is inserted externally into the root of the metatarsal bone of the little toe ; its use is to assist the *peroneus longus*.

Ques. 40. What is the origin, insertion, and use of the *tibialis anticus* ?

Ans. It arises from the outside of the anterior tuberosity of the tibia, from the outside of the bone itself, and from the *interosseous ligament*, its tendon passing under the *annular ligament* of the tarsus ; it is inserted into the inner part of the *os cuneiforme internum* and root of the metatarsal bone of the great toe ; its use is to bend the foot and turn the toes inward.

Ques. 41. What is the origin, insertion, and use of the *peroneus tertius* or *nonus vesalii* ?

Ans. It arises from the middle of the fibula, almost to its inferior extremity ; it is inserted into the root of the metatarsal bone of the little toe ; its use is to assist in bending the foot.

Ques. 42. How many muscles arise from the leg and are inserted into the toes ?

Ans. There are four ; viz., the *extensor longus digito-*

rum pedis, extensor proprius pollicis pedis, flexor longus digitorum pedis profundus perforans, and flexor longus pollicis pedis.

Ques. 43. What is the origin, insertion, and use of the extensor longus digitorum pedis ?

Ans. It arises from the anterior inner part of the head of the fibula, from the anterior outer part of the head of the tibia, from the interosseous ligament, and from the fascia of the leg, also from the anterior spine of the fibula ; it is inserted into all the phalanges of the four lesser toes ; its use is to bend the ankle joint, and to extend all the joints of the toes into which it is inserted.

Ques. 44. What is the origin, insertion, and use of the extensor proprius pollicis pedis ?

Ans. It arises from the anterior part of the fibula, some way below its head, to nearly its lower extremity ; it is inserted into the posterior part of both the bones of the great toe ; its use is to bend the ankle joint, and to extend the great toe.

Ques. 45. What is the origin, insertion, and use of the flexor longus digitorum pedis profundus perforans ?

Ans. It arises from the oblique ridge on the upper back part of the tibia, and from the inner and outer edges of this bone ; enclosing the tibialis posticus by its fibres, and afterwards passing through a groove of the os calcis, it divides into four tendons which run through those of the perforatus ; it receives a slip of tendon from the flexor pollicis longus ; it is inserted into the extremity of the last joint of the four lesser toes ; its use is to extend the ankle joint, to turn the foot inward, and to bend the toes.

Ques. 46. What is the origin, insertion, and use of the flexor longus pollicis pedis ?

Ans. It arises posteriorly from below the head of the fibula, being continued almost to its inferior extremity ; it is inserted into the posterior part of both bones of the

great toe ; its use is to extend the ankle joint and to bend the great toe.

Ques. 47. How many muscles arise from the tarsus and metatarsus, and are inserted into the toes generally ?

Ans. There are three ; viz., the extensor brevis digitorum pedis, flexor brevis digitorum pedis, and flexor digitorum accessorius, or massa carnea Jacobi Sylvii.

Ques. 48. What is the origin, insertion, and use of the extensor brevis digitorum pedis ?

Ans. It arises from the anterior and upper part of the calcaneum, lying under the tendons of the extensor longus ; it is inserted into the posterior part of all the toes, except the little one ; its use is to extend the toes.

Ques. 49. What is the origin, insertion, and use of the flexor brevis digitorum pedis ?

Ans. It arises between the abductors of the little and great toes, from protuberances upon the inferior posterior part of the calcaneum ; it is inserted by four tendons into the second phalanx of the four lesser toes, that of the little toe is sometimes wanting ; its use is to bend the first and second joints of the four lesser toes.

Ques. 50. What is the origin, insertion, and use of the flexor digitorum accessorius or massa carnea Jacobi Sylvii ?

Ans. It arises from the external tuberosity of the calcaneum, and from a great part of its internal concavity ; it is inserted by means of the tendons of the flexor longus, which it joins at its division ; its use is to assist the flexor longus.

Ques. 51. What muscles arise from the tendons of the flexor longus, and are inserted into the toes ?

Ans. The lumbricales pedis.

Ques. 52. What is their origin, insertion, and use ?

Ans. They arise by four commencements from the tendon of the flexor profundus, near the insertion of the massa carnea, and just before its division ; they are in-

serted, by four tendons, into the internal posterior part of the four lesser toes ; their use is to draw the toes inward, and to bend their first joint and to extend the rest.

Ques. 53. How many muscles arise from the tarsus and metatarsus, and are inserted into the toes ?

Ans. There are twelve ; viz., the adductor pollicis pedis flexor, brevis pollicis, abductor pollicis pedis, adductor minimi digiti pedis, flexor brevis minimi digiti pedis, abductor minimi digiti pedis, adductor indicis pedis, abductor indicis pedis, adductor medii digiti pedis, abductor medii digiti pedis, adductor tertii digiti pedis, and abductor tertii digiti pedis.

Ques. 54. What is the origin, insertion, and use of the adductor pollicis pedis ?

Ans. It arises from the inner protuberance of the calcaneum, and from the same bone where it joins the naviculare ; it is inserted into the os sessamoideum internum, and the base of the first bone of the great toe ; its use is to adduct the great toe.

Ques. 55. What is the origin, insertion, and use of the flexor brevis pollicis ?

Ans. It arises from the inferior anterior part of the calcaneum where it joins the cuboides, and from the cuneiforme externum, being internally connected with the abductor and adductor ; it is inserted into the os sessamoideum externum, and base of the first bone of the great toe ; its use is to bend the first joint of the great toe.

Ques. 56. What is the origin, insertion, and use of the abductor pollicis pedis ?

Ans. It arises from the calcaneum, cuboides, cuneiforme externum, and the base of the metatarsal bone of the second toe ; it is inserted into the os sessamoideum externum, and the base of the metatarsal bone of the great toe ; its use is to abduct the great toe.

Ques. 57. What is the origin, insertion, and use of the adductor minimi digiti pedis ?

Ans. It arises from the inside of the root of the metatarsal bone of the little toe ; it is inserted into the inside of the base of the first bone of the little toe ; its use is to adduct the little toe.

Ques. 58. What is the origin, insertion, and use of the flexor brevis minimi digiti pedis ?

Ans. It arises from the cuboides near the groove of the peroneus longus, and from the outside of its own metatarsal bone ; it is inserted into the top of the metatarsal bone, and base of the first bone of the little toe ; its use is to bend the first joint of the little toe.

Ques. 59. What is the origin, insertion, and use of the abductor minimi digiti pedis ?

Ans. It arises from before the external protuberance of the calcaneum, and from the root of the metatarsal bone of the little toe ; it is inserted into the base of the first bone of the little toe ; its use is to abduct the little toe.

Ques. 60. What is the origin, insertion, and use of the adductor indicis pedis ?

Ans. It arises from the inside of the base of the metatarsal bone of the second toe, from the outside of the base of the metatarsal bone of the great toe, and from the cuneiforme internum ; it is inserted into the inside of the base of the first bone of the second toe ; its use is to adduct the second toe.

Ques. 61. What is the origin, insertion, and use of the abductor indicis pedis ?

Ans. It arises from the base of the metatarsal bones of the second and third toes ; it is inserted into the outside of the second toe ; its use is to abduct the second toe.

Ques. 62. What is the origin, insertion, and use of the adductor medii digiti pedis ?

Ans. It arises from the inside of the base of the metatarsal bone of the middle toe ; it is inserted into the inside

of the base of the first bone of the middle toe ; its use is to adduct the middle toe.

Ques. 63. What is the origin, insertion, and use of the abductor medii digiti pedis ?

Ans. It arises from the bases of the metatarsal bones of the second and third toes ; it is inserted into the outside of the base of the first bone of the second toe ; its use is to abduct the second toe.

Ques. 64. What is the origin, insertion, and use of the adductor tertii digiti pedis ?

Ans. It arises from the inner and under part of the base of the metatarsal bone of the third toe ; it is inserted into the inside of the base of the first bone of the third toe ; its use is to adduct the third toe.

Ques. 65. What is the origin, insertion, and use of the abductor tertii digiti pedis ?

Ans. It arises from the roots of the metatarsal bones of the third and little toes ; it is inserted into the outside of the base of the first bone of the third toe ; its use is to abduct the third toe.

Ques. 66. What muscle arises from one bone of the metatarsus and is inserted into another ?

Ans. The transversalis pedis.

Ques. 67. What is its origin, insertion, and use ?

Ans. It arises inferiorly from the anterior end of the metatarsal bone of the great toe, and from its os sesamoidum internum ; it is inserted inferiorly and externally into the anterior end of the metatarsal bone of the little toe, and the ligament of the next one ; its use is to contract the foot from side to side.

SECTION XXIII.

BURSÆ MUCOSÆ.

Ques. 1. What are the bursæ mucosæ ?

Ans. They are mucous bags of a delicate transparent texture, and whose internal surfaces are lubricated by a synovial fluid.

Ques. 2. What are their use ?

Ans. They answer the purpose of friction bags, allowing the ready play of tendons over bone, &c.

Ques. 3. Where are they generally situated ?

Ans. They are chiefly situated in the extremities between tendons which rub against each other ; or where they play on the surface of bones or joints, and between the integuments and certain prominent points of bone, viz., at the knee, elbow, and knuckles.

Ques. 4. What is their structure ?

Ans. The structure of the membrane which forms them is similar to that of the synovial membranes of joints.

Ques. 5. How are they connected with the surrounding parts ?

Ans. They adhere with great firmness to the parts betwixt which they lie.

Ques. 6. What is their internal arrangement ?

Ans. Their internal surfaces are in contact, and are only lubricated by the synovial fluid which is formed in them.

SECTION XXIV.

FASCIA.

Ques. 1. What are the fascia?

Ans. They are tendinous expansions which brace and protect the muscles whilst in action, and support the form of parts; they are sometimes called aponeuroses.

Ques. 2. Enumerate the most important fascia.

Ans. The temporal fascia, the fascia of the arm, the fascia of the forearm, the palmar fascia, the femoral fascia, the fascia of the leg, and the plantar fascia.

Ques. 3. What are the attachments of the temporal fascia?

Ans. It is attached to the temporal ridges of the os frontis and os parietalia, and the upper edge of the zygoma and posterior edge of the os malæ, and temporal process of the os frontis.

Ques. 4. What is the texture of the fascia of the arm?

Ans. It is much thinner than that of the forearm, from which it receives a considerable addition.

Ques. 5. From what is the fascia of the forearm principally derived?

Ans. The tendon of the biceps.

Ques. 6. Whence is the palmar fascia derived?

Ans. From the internal annular ligament, and the tendon of the palmaris longus.

Ques. 7. Whence is the femoral fascia derived?

Ans. From the tensor vaginæ femoris, and glutæus maximus; it is also called the fascia lata of the thigh.

Ques. 8. Where are the fasciæ of the extremities strongest?

Ans. On the inner and anterior part of the forearm; and the fascia lata exceeds all others in density at the outer part of the thigh.

SPLANCHNOLOGY.

Ques. 1. What is splanchnology?

Ans. Splanchnology treats of the structure of the viscera and organs of the senses.

Ques. 2. Where are the viscera chiefly situated?

Ans. In the great cavities of the body.

Ques. 3. What are the names of the great cavities of the body?

Ans. The cranium, the thorax, and the abdomen.

SECTION XXV.

THORACIC VISCERA.

Ques. 1. What is the situation of the thorax?

Ans. It is placed between the neck and the abdomen.

Ques. 2. How is it formed?

Ans. The hard parts composing it are the dorsal vertebræ, the ribs, and the sternum; the soft parts are the pleura, the intercostal muscles, and the diaphragm.

Ques. 3. What is its general form ?

Ans. It is of a conical figure.

Ques. 4. What are the viscera of the thorax ?

Ans. The pleura, the thymus gland, the heart and great vessels, the pericardium, the lungs, and the œsophagus.

Pleura.

Ques. 5. What is the situation of the pleura ?

Ans. It lines the cavity of the thorax, and closely invests the lungs.

Ques. 6. What is its structure ?

Ans. It is a thin, transparent membrane ; its outer surface is adherent to the thorax and lungs ; its inner surface is smooth and lubricated.

Ques. 7. What is the use of this membrane ?

Ans. Its use is to afford a smooth and firm covering to the lungs, and a lining to the cavity of the thorax, and to subdivide this into two cavities.

Ques. 8. What is the name of the duplicature of the pleura ?

Ans. The mediastinum.

Ques. 9. How is the mediastinum formed ?

Ans. The portions of the pleura which line the parities of the thorax on each side meet behind the sternum, unite, and forming a double membrane are reflected directly backwards ; they then separate to invest the heart, pericardium, and great vessels ; they give off the covering to the lungs ; and then behind the heart they again approach each other and pass to the bodies of the vertebræ, so that in fact there are two pleuræ, one for each side.

Ques. 10. What cavities are situated between the duplicatures of the pleuræ ?

Ans. There are three, viz., the anterior, posterior, and middle cavities of the mediastinum.

Ques. 11. What is contained in the anterior cavity?

Ans. The thymus gland in the fœtus.

Ques. 12. What does the middle cavity contain?

Ans. The heart and pericardium.

Ques. 13. What does the posterior cavity contain?

Ans. The bronchia, œsophagus, descending aorta and beginning of the intercostal arteries, the descending cava, the vena azygos, the thoracic duct, the par vagum, and great sympathetic nerve.

Ques. 14. To what part of the sternum is the mediastinum attached?

Ans. To the posterior part, a little to the left side.

Ques. 15. What names have been given to other parts of the pleura?

Ans. That part of the pleura which covers the lungs has been called pleura pulmonalis; where it lines the thorax, pleura costalis; and its outer surface, its cellular portion.

Ques. 16. How is the inner surface moistened?

Ans. It is lubricated by a serous fluid, which transudes from its pores.

Ques. 17. From whence are the arteries of the pleura derived?

Ans. Chiefly from the intercostals and bronchial.

Ques. 18. Whither do the veins of the pleura pass?

Ans. They pass to those which correspond with the arteries in name and distribution.

Ques. 19. From whence are its nerves derived?

Ans. From the intercostals.

Thymus Gland.

Ques. 20. What is the situation of the thymus gland?

Ans. It is situated in the superior part of the anterior cavity of the mediastinum.

Ques. 21. What is its form?

Ans. It is of an oblong figure, having two processes above and two below.

Ques. 22. What is its structure?

Ans. It has the appearance of a glandular structure.

Ques. 23. Is the thymus gland largest in the fœtus or in the adult?

Ans. In the foetus it is of considerable size; in the adult there hardly remains a vestige of it.

Ques. 24. What is its use?

Ans. Its use, (which is unknown,) appears to be confined to the fœtal state.

Pericardium.

Ques. 25. What is the pericardium?

Ans. It is a firm membranous bag.

Ques. 26. What is its situation?

Ans. It surrounds the heart.

Ques. 27. What is its form?

Ans. It is somewhat conical, corresponding to the figure of the heart.

Ques. 28. What is its structure?

Ans. It consists of three laminae, of which the middle one is composed of dense tendinous filaments; the inner one is a continuation of the outer coat of the heart; and the outer one is derived from the pleura.

Ques. 29. What are its connections?

Ans. It adheres firmly to the tendinous part of the diaphragm, and to the great vessels at the base of the heart, the beginning of which it includes within its cavity.

Ques. 30. How is the inner surface of the pericardium moistened?

Ans. It is lubricated by a serous fluid, transuding from the exhalents.

Ques. 31. What is this fluid called?

Ans. It is called the liquor pericardii; the condensation and accumulation of this fluid, which takes place after death, affords a sensible quantity of it.

Heart.

Ques. 32. What is the heart?

Ans. It is a hollow muscular organ, which receives the blood from, and transmits it to, all the parts of the body.

Ques. 33. What is its situation?

Ans. It is invested by the pericardium, and is situated between the lungs, and rests on the superior part of the diaphragm.

Ques. 34. What is its form?

Ans. It is somewhat of a conical form, flattened, however on its inferior surface and rounded at its upper part.

Ques. 35. How is the heart divided externally?

Ans. It is divided into a basis, turned backwards and upwards; an apex, pointing forward and to the left side; a rounded edge to the right, a more acute edge to the left; a superior convex surface, and an inferior flat surface.

Ques. 36. What are its divisions internally?

Ans. It is divided internally into four cavities, viz., two auricles at its base, and two ventricles forming its body.

Ques. 37. What communications exist between the cavities of the heart?

Ans. There is no communication betwixt the two auricles, nor any betwixt the two ventricles; but the right auricle communicates with the right ventricle, and there is a similar opening between the left auricle and the left ventricle; the two sides of the heart are therefore distinct.

Ques. 38. What is the use of the auricles?

Ans. They receive the blood from the great venous trunks which are fixed to them, and transmit it to the ventricle.

Ques. 39. What is the use of the ventricles?

Ans. They have each a large artery into which they propel the blood.

Right Auricle.

Ques. 40. What is the situation of the right auricle?

Ans. It is situated toward the anterior part of the base of the heart.

Ques. 41. How is it divided from the left auricle?

Ans. By the septum auricularum.

Ques. 42. What are the muscoli pectinati?

Ans. They are transverse fleshy fibres on the sides of the auricle.

Ques. 43. What veins open into the right auricle?

Ans. The two venæ cavæ and the coronary vein.

Ques. 44. What is the appendix to the auricle?

Ans. There is an irregular appendix of the auricle communicating with its cavity.

Ques. 45. Where does the vena cava superior open into the right auricle?

Ans. Into its upper posterior part.

Ques. 46. Where does the inferior cava enter?

Ans. Into its lower posterior part.

Ques. 47. Where is the tuberculum Loweri situated?

Ans. It is an angular projection between the mouths of the two cava.

Ques. 48. Where does the coronary vein enter the right auricle?

Ans. Towards the inner and inferior part.

Ques. 49. How is the mouth of the coronary vein protected?

Ans. By a considerable semilunar valve.

Ques. 50. What is the valve of Eustachius ?

Ans. It is a fold of the inner membrane, situated to the left of the opening of the inferior cava.

Right Ventricle.

Ques. 51. What is the situation of the right ventricle ?

Ans. It is situated at the anterior part of the right side of the heart.

Ques. 52. Is the right or left ventricle the largest ?

Ans. The right is larger than the left, though its parietes are thinner.

Ques. 53. What are the columnæ carneæ ?

Ans. They are fleshy pillars, by the contraction of which the valves of the ventricles are closed.

Ques. 54. What are the corda tendinæ ?

Ans. They are the tendons of the columnæ carneæ by which they are connected to the edges of the valves.

Ques. 55. How is the communication between the right auricle and ventricle protected ?

Ans. By the tricuspid valve.

Ques. 56. What is the construction of this valve ?

Ans. It is a tendinous curtain fixed around the circular opening into the ventricle ; its opposite edge presents three points, which are connected to the sides of the ventricle by tendinous cords.

Ques. 57. What is the use of this valve ?

Ans. When the ventricle contracts, this valve prevents the blood from returning into the auricle.

Ques. 58. What artery arises from the right ventricle ?

Ans. The pulmonary artery, at its upper and left side.

Ques. 59. How is the mouth of the pulmonary artery protected ?

Ans. It is guarded by three semilunar valves.

Ques. 60. What is the particular form of the semilunar valves ?

Ans. The loose edge of each resembles two small crescents, uniting in a middle papilla, called corpus sesamoidum aurantii.

Ques. 61. What is the use of these valves ?

Ans. They support the column of blood in the artery, and prevent its returning into the ventricle.

Left Auricle.

Ques. 62. Where is the left auricle situated ?

Ans. At the superior and posterior part of the left side of the heart.

Ques. 63. What difference is there in the size of the left auricle from that of the right ?

Ans. The left is smaller than the right, but its sides are thicker.

Ques. 64. What is its structure ?

Ans. It resembles that of the right auricle.

Ques. 65. What veins open into the left auricle ?

Ans. The four pulmonary veins.

Left Ventricle.

Ques. 66. What is the situation of the left ventricle ?

Ans. It is situated at the posterior and left part of the heart.

Ques. 67. What is its general structure ?

Ans. It is similar to that of the right.

Ques. 68. How is the communication between the left auricle and ventricle protected ?

Ans. The mitral valve is placed at this communication.

Ques. 69. What is the construction of the mitral valve ?

Ans. It resembles the tricuspid in situation, use, and structure, and differs from it only in being divided into two portions only ; which has occasioned it to be compared to a bishop's mitre.

Ques. 70. What artery arises from the left ventricle?

Ans. The aorta, which is situated at its upper and fore part.

Ques. 71. How is the mouth of the aorta protected?

Ans. By three semilunar valves.

Ques. 72. What is the structure and use of the semilunar valves of the aorta?

Ans. Their structure and use exactly correspond with those of the pulmonary artery.

Arteries, Veins, and Nerves of the Heart.

Ques. 73. Whence are the coronary arteries derived?

Ans. They arise from the commencement of the aorta, immediately behind its semilunar valves.

Ques. 74. What is the course and distribution of these arteries?

Ans. That which supplies the right side runs between the right auricle and ventricle; the left passes between the pulmonary artery and left ventricle, and divides into branches.

Ques. 75. Where do the coronary veins terminate?

Ans. They open into the right auricle.

Ques. 76. From whence are the nerves of the heart derived?

Ans. From the cardiac plexus.

Trachea.

Ques. 77. What is the situation of the trachea?

Ans. It is situated anteriorly in the lower part of the neck, and in the thorax behind the thymus gland, and between the two pleuræ in the space left superiorly between the duplicature of the mediastinum.

Ques. 78. What is its form?

Ans. It is of a tubular form, flattened posteriorly.

Ques. 79. What is the structure of the trachea ?

Ans. It consists anteriorly of segments of cartilaginous circles, forming an incomplete canal, which is membranous posteriorly.

Ques. 80. Into what does the trachea divide ?

Ans. At its termination it divides into two tubes of similar structure, called bronchiæ.

Ques. 81. Where does this division take place ?

Ans. Behind the curvature of the aorta.

Ques. 82. With what is the trachea lined ?

Ans. By a very irritable mucous membrane.

Ques. 83. How many coats has the trachea ?

Ans. Four, including the internal lining.

Ques. 84. Whence is the external coat derived ?

Ans. It is a continuation of the cellular covering of the lungs.

Ques. 85. What is the second coat ?

Ans. It is the internal perichondrium to its cartilages.

Ques. 86. What forms the third coat ?

Ans. It has been supposed to be muscular ; it completes the circumference of the cartilaginous circles.

Lungs.

Ques. 87. Where are the lungs situated ?

Ans. They are situated in the cavity of the thorax, which they chiefly fill.

Ques. 88. What is their general form ?

Ans. They are adapted to the cavity which contain them, being convex next the ribs, concave next the diaphragm, and irregularly formed next the mediastinum and heart.

Ques. 89. Into what portions are the lungs divided ?

Ans. They consist of two great lateral parts, or a right and a left lung, having between them the heart and

mediastinum; the right lung is subdivided into three lobes, and the left into two.

Ques. 90. In what part of the lungs is the notch occasioned by the apex of the heart?

Ans. At the lower edge of the left lung

Ques. 91. What is the structure of the lungs?

Ans. They are almost entirely of a spongy texture, consisting of an immense number of small membranous cells.

Ques. 92. By what membrane is the lungs invested?

Ans. The pleura pulmonalis.

Ques. 93. Where do the bronchiæ ramify?

Ans. Within the substance of the lungs.

Ques. 94. What is their form?

Ans. They are conical tubes; they divide, and subdivide.

Ques. 95. What structure do the minute ramifications of the bronchiæ assume?

Ans. They become membranous.

Ques. 96. Where do they terminate?

Ans. In the vesiculæ bronchialis, or air cells.

Ques. 97. How are the air cells connected?

Ans. In bundles.

Ques. 98. What are these bundles termed?

Ans. Lobuli.

Ques. 99. What is the structure of the bronchiæ.

Ans. In structure they resemble the trachea.

Ques. 100. What is the relative situation of the bronchial vessels to the branches of the pulmonary artery and vein?

Ans. A branch of the bronchia generally lies between one of the pulmonary arteries and pulmonary vein.

Ques. 101. What is the interlobular substance?

Ans. It is the cellular or spongy substance which surrounds the lobuli, and connects them together.

Ques. 102. What effect is produced by inflating the interlobular substance?

Ans. If this be inflated, the lobuli are compressed and flattened.

Arteries, Veins, and Nerves of the Lungs.

Ques. 103. What are the blood vessels of the lungs?

Ans. They are of two kinds,—one common, called the pulmonary artery and veins; the other proper, called the bronchial arteries and veins.

Ques. 104. How is the pulmonary artery ramified in the lungs?

Ans. It divides into two branches, one for each lung; they take the same course as the bronchiæ, and ramifying on the surfaces of the bronchial cells, they form a beautiful plexus, called the rete mirabile of Malpighi.

Ques. 105. Which are the nutrient arteries of the lungs?

Ans. The bronchial arteries.

Ques. 106. What veins receive the blood of the bronchial arteries?

Ans. The bronchial veins.

Ques. 107. Whither do the bronchial veins pass?

Ans. They pass irregularly, either to the vena azygos or guttural vein.

Ques. 108. What blood do the pulmonary veins receive?

Ans. The blood from the pulmonary arteries.

Ques. 109. How many pulmonary veins are there?

Ans. There are four; two for each lung.

Ques. 110. Whither do they pass?

Ans. To the left auricle of the heart.

Ques. 111. Whence are the nerves of the lungs derived?

Ans. From the eighth pair, and great sympathetic.

Bronchial Glands.

Ques. 112. Where are the bronchial glands situated?

Ans. They are situated about the termination of the trachea and beginning of the bronchiæ.

Ques. 113. What is their appearance?

Ans. They are of various sizes, and usually of a motley blue appearance.

Ques. 114. To what kind of glands do the bronchial belong?

Ans. They are sympathetic glands, connected with the absorbent vessels of the lungs.

SECTION XXVI.

CIRCULATION OF THE BLOOD.

Ques. 1. How is the circulation of the blood effected?

Ans. By the alternate contraction of the auricles and ventricles, called the diastole and systole of the heart.

Ques. 2. What is the diastole of the heart?

Ans. The diastole is the dilatation of the ventricles, occasioned by the contractions of the auricles on their contents.

Ques. What is the systole of the heart?

Ans. It is the contraction of the ventricles, by which the blood they contain is propelled through all the arteries.

Ques. 4. Describe the course of the blood.

Ans. The blood being returned by the superior vena cava from the upper part of the body, and by the inferior vena cava from the lower part, is emptied into the right auricle; this contracts and discharges its contents into the right ventricle: when completely filled the right ventricle contracts; by that contraction its tricuspid valve is shut, and its contents propelled through the ramifications of the pulmonary artery in the lungs. The blood is returned by the four pulmonary veins into the left auricle, which, being distended, now contracts and throws its blood into the left ventricle; the left ventricle then also contracts, its mitral valve shuts, and all its blood is propelled through the aorta into the capillary vessels of the system; these capillaries possess a power of suction, which gives impetus to the blood. It is again returned by the veins into the two venæ cavæ and the right auricle, to undergo precisely the same process. The mouths of the aorta and pulmonary artery being each protected by three semilunar valves, the blood is prevented passing back from them into the ventricles.

Ques. 5. What sensible change is produced on the blood in the lungs?

Ans. The venous blood, which is brought to the right side of the heart, is of a dark purple hue; during its passage through the lungs, it attracts oxygen from the air in the bronchial cells, and gives out a quantity of carbonic acid gas; when returned to the left auricle, it is found of a bright florid red.

SECTION XXVII.

RESPIRATION.

Ques. 1. What is respiration?

Ans. Respiration consists in inhaling and exhaling the atmospherical air to and from the lungs, or in inspiration and expiration.

Ques. 2. How is inspiration performed?

Ans. The diaphragm contracting descends, and the ribs are raised; thus the cavity of the thorax is suddenly enlarged, which occasions air to rush in at the trachea, and fills the cells of the lungs.

Ques. 3. How is expiration performed?

Ans. Expiration is effected by the relaxation and consequent ascent of the diaphragm, and descent of the ribs; the capacity of the thorax being thus diminished, the air is expelled from the lungs.

SECTION XXVIII.

ABDOMINAL VISCERA.

Ques. 1. Where is the abdomen situated?

Ans. Between the thorax and pelvis.

Ques. 2. How is the cavity of the abdomen formed ?

Ans. It is bounded above by the diaphragm and the margin of the chest ; behind by the five lumbar vertebræ ; below by the pelvis ; anteriorly and laterally by the abdominal muscles.

Ques. 3. Into how many regions is the abdomen divided ?

Ans. It is divided into three regions ; a superior or epigastric region, a middle or umbilical region, and an inferior or hypogastric region.

Ques. 4. Describe the epigastric region.

Ans. The epigastric region is all that part which is situated above a line passing from the last rib on one side across the abdomen to the last rib on the other side.

Ques. 5. How is this region subdivided ?

Ans. It is divided into three other regions ; viz., the scrobiculus cordis or epigastrium in the middle, and the two hypochondria on each side, under the edge of the false ribs.

Ques. 6. What are the boundaries of the umbilical region ?

Ans. It extends equally above and below the navel, between the other two.

Ques. 7. How is the umbilical region subdivided ?

Ans. It is divided into its middle or umbilicus, two lateral regions called ilia, and posteriorly the regis lumborum.

Ques. 8. What are the boundaries of the hypogastric region ?

Ans. It is all that part below a line extending from the superior and anterior spinous process of the ilii.

Ques. 9. How is the hypogastric region subdivided ?

Ans. Its middle is called the regio-pubis ; its sides the inguinal regions.

Ques. 10. What membrane lines the cavity of the abdomen ?

Ans. A thin membrane called the peritoneum.

Ques. 11. What are the contents of the abdomen?

Ans. Besides the peritoneum it contains the organs of digestion and chyification, viz. the stomach, intestines, liver, spleen, and pancreas : the urinary organs, viz. the kidneys, ureters, and bladder : and lastly, part of the organs of generation.

Peritoneum.

Ques. 12. What is the situation of the peritoneum?

Ans. It adheres to the inner surface of the abdominal cavity ; it is reflected over, invests, and supports the viscera.

Ques. 13. What is its structure?

Ans. It is a thin membrane, resembling the pleura in structure.

Ques. 14. What is the appearance of the outer surface of the peritoneum?

Ans. Its outer surface is cellular, and is adherent to the surfaces of the viscera, with which it is in contact.

Ques. 15. What is the appearance of its inner surface?

Ans. It is very smooth and polished.

Ques. 16. How is the peritoneum moistened?

Ans. By a serous fluid, discharged from exhalent vessels.

Ques. 17. What are the duplicatures of the peritoneum?

Ans. They are very extensive and numerous ; after having completely invested an organ, the peritoneum passes double to the parieties of the abdomen, to be here expanded ; these duplicatures confine the organs in their places, and support them. They are sometimes called ligaments ; the extensive one which supports the intestines, is called the mesentery ; and a very large one, hanging loose before the intestines, is called the omentum.

Ques. 18. What are the processes of the peritoneum ?

Ans. They are elongations, which accompany parts in their exit from the cavity of the abdomen.

Ques. 19. What ligamentous cords are seen upon the anterior surface of the peritoneum ?

Ans. There are four ; they are the remains of parts peculiar to the fœtus, viz., the two umbilical arteries, the umbilical vein and the urachus.

Stomach.

Ques. 20. What is the stomach ?

Ans. The stomach is a membranous bag, into which the food is received, and where it is digested.

Ques. 21. Where is it situated ?

Ans. It is situated in the left hypochondrium, and in the epigastrium.

Ques. 22. What is its form ?

Ans. It is oblong and incurvated, large at one end and small at the other.

Ques. 23. Where is its greater extremity ?

Ans. It is situated toward the left side.

Ques. 24. Where is its lesser extremity ?

Ans. Towards the right side.

Ques. 25. Where is its lesser curvature situated ?

Ans. It forms a small curvature superiorly, which is turned rather backward when the stomach is full.

Ques. 26. Where is the greater curvature situated ?

Ans. It is placed inferiorly when empty, rather anteriorly when full.

Ques. 27. How many openings has the stomach ?

Ans. It has two.

Ques. 28. What are they called ?

Ans. One is called the cardia, the other the pylorus.

Ques. 29. Where is the cardia situated ?

Ans. It is placed at its superior part, at a little distance from its greater extremity.

Ques. 30. What is the situation of the pylorus ?

Ans. It is placed at the termination of its lesser extremity, and at the beginning of the intestines.

Ques. 31. What is the relative situation of the cardia and pylorus ?

Ans. The pylorus is situated lower, and turned more forward than the cardia.

Ques. 32. How many coats has the stomach ?

Ans. Four.

Ques. 33. What are the names of these coats ?

Ans. They are the peritoneal, the muscular, the nervous, and the villous coats.

Ques. 34. What is the situation of the peritoneal coat ?

Ans. It is the most external ; it is smooth and lubricated.

Ques. 35. Where is the muscular coat ?

Ans. Immediately within the peritoneal.

Ques. 36. Of how many planes of fibres does the muscular coat consist ?

Ans. Two : an external and an internal.

Ques. 37. What is the course of the external plane of fibres ?

Ans. The external plane is longitudinal.

Ques. 38. What is the course of the internal plane ?

Ans. The internal plane of fibres run circularly transverse.

Ques. 39. Where is the nervous coat situated ?

Ans. Immediately within the muscular coat.

Ques. 40. What is its structure ?

Ans. It is cellular or filamentary, containing numerous small glands.

Ques. 41. What is the situation of the villous coat ?

Ans. It is the most internal coat of the stomach.

Ques. 42. What is its structure ?

Ans. It somewhat resembles the pile of velvet, and is very vascular.

Ques. 43. How are the rugæ of the stomach formed?

Ans. The two internal coats of the stomach, being more extensive than the external, are thrown into folds called rugæ.

Ques. 44. What is the direction of these rugæ?

Ans. They are chiefly placed in a transverse direction.

Ques. 45. From whence are the nerves of the stomach derived?

Ans. From the eighth pair, and great sympathetic.

Ques. 46. From whence are the arteries of the stomach derived?

Ans. They come from the cæliac.

Ques. 47. Whence do the veins pass?

Ans. They go to the vena portæ.

Intestines.

Ques. 48. What are the intestines?

Ans. They are a long membranous tube, beginning at the pylorus, and ending at the anus.

Ques. 49. How are they divided?

Ans. They are divided into the large and small intestines; the small being subdivided into the duodenum, jejunum, and ilium—and the large into the cæcum, colon, and rectum.

Duodenum.

Ques. 50. Where is the duodenum situated?

Ans. It is situated immediately below the pylorus.

Ques. 51. What is its length?

Ans. It is about twelve fingers breadth in length, as its name imports.

Ques. 52. What is its course?

Ans. It first bends a little backward and downward, then towards the right kidney, and thence it passes before the renal artery and vein, gradually ascending to the left, before the aorta and the last dorsal vertebræ; it then continues its course a little forward, making a small turn.

Ques. 53. How is the duodenum fixed?

Ans. It is retained in its situation by the folds of the peritoneum, and especially by a transverse duplicature, which gives origin to the meso-colon.

Ques. 54. How many coats has the duodenum?

Ans. It, with all the rest of the small intestines, have four coats, resembling those of the stomach.

Ques. 55. What is peculiar to the peritoneal coat of the duodenum?

Ans. It does not invest the whole circumference of the intestine.

Ques. 56. What is the peculiarity of the muscular coat of this intestine?

Ans. It is thicker than in the jejunum and ilium.

Ques. 57. What is the peculiar disposition of the nervous and villous coats of the small intestines?

Ans. The nervous and villous coats of the small intestines are much more extensive than the other two, and are thrown into folds called *valvulæ conniventes*.

Ques. 58. What is the form of the *valvulæ conniventes*?

Ans. They resemble portions of circular plains, having one edge fixed to the intestine and the other loose.

Ques. 59. In what intestines are the *valvulæ conniventes* largest and most frequent?

Ans. In the duodenum they are small, but grow much larger and more numerous in the jejunum, and again decrease in the ilium.

Ques. 60. How do the villi of the duodenum differ from those of the jejunum ?

Ans. They are much less conspicuous in the duodenum than in the jejunum.

Ques. 61. Where do the biliary and pancreatic ducts open into the duodenum ?

Ans. On the short side of its first incurvation there is an opening, which is the common aperture of the excretory duct of the liver and of the pancreas.

Jejunum and Ilium.

Ques. 62. How is the termination of the jejunum distinguished from the beginning of the ilium ?

Ans. There is no mark of distinction between the termination of the jejunum and the beginning of the ilium ; this division is therefore arbitrary. It is usual to consider the superior two-fifths as the jejunum and the remainder as the ilium.

Ques. 63. What is the course of the jejunum ?

Ans. The jejunum, beginning at the duodenum, bends from left to right and obliquely forward, making several convolutions ; it lies chiefly in the upper part of the umbilical region.

Ques. 64. How do the valvulæ conniventes of the jejunum differ from those of the duodenum and ilium ?

Ans. Those of the jejunum are more prominent, loose, and floating than in the duodenum, and they gradually diminish in the ilium.

Ques. 65. What glands are found in the jejunum and ilium ?

Ans. The glands of Peyer and Brunner. They exist in irregular clusters.

Ques. 66. Where are they most numerous ?

Ans. Towards the end of the ilium.

Cæcum.

Ques. 67. What is the cæcum ?

Ans. The cæcum or blind gut is a short, roomy pouch, into which the ilium opens.

Ques. 68. What is its situation ?

Ans. It is situated under the right kidney upon the iliacus internus ; its bottom being turned downward.

Ques. 69. What is the appendix of the cæcum named ?

Ans. A worm-like body is fixed to it, called appendix cæci vermiformis.

Ques. 70. Where does the appendix cæci vermiformis open into the cæcum ?

Ans. On the inner side of its bottom ; its other extremity is impervious.

Ques. 71. What is its size ?

Ans. Its diameter is about a quarter of an inch, and it is about three inches long.

Ques. 72. What is its structure ?

Ans. In structure it resembles very closely the intestines.

Ques. 73. What is its use ?

Ans. Its use is not understood ; it has been thought by some to secrete the odorous matter of the excrement.

Colon.

Ques. 74. What is the situation of the colon ?

Ans. The colon forms the greater part of the large intestines ; it is situated around the small ones, beginning at the cæcum and ending at the rectum.

Ques. 75. What is its course ?

Ans. It ascends in the right iliac region ; it then forms the great arch above the umbilical region, crossing from the right kidney to the lower part of the left hypochon-

drium ; this arch is situated immediately below the liver, gall, bladder, and stomach ; thence the colon turns back under the spleen, runs before the left kidney, turns towards the vertebræ, and terminates by a double incurvation.

Ques. 76. What is this incurvation called ?

Ans. It is called its sigmoid flexure.

Ques. 77. What guards the opening of the small into the large intestines ?

Ans. At the termination of the ilium a pair of valves are situated, called *valvulæ coli*, or *valvulæ cæci*, or *valvulæ ili*.

Ques. 78. What is the form of this opening ?

Ans. It resembles a fissure, its middle being most open.

Ques. 79. What is the structure of the large intestines ?

Ans. The colon, as well as the cæcum and rectum, has the same number and kind of coats as the small intestines.

Ques. 80. What is the character of the muscular coat of the large intestines ?

Ans. The longitudinal fibres of the muscular coat are collected into three distinct bundles, called the longitudinal bands, beginning at the cæcum ; besides these, there are occasionally transverse bands.

Ques. 81. What are the cavities called which are formed by the contraction of the bands of the colon ?

Ans. They are called the cells of the colon.

Ques. 82. What are the *appendices coli adiposæ* ?

Ans. There are many fatty processes hanging from the outside of the colon and cæcum, called *appendices coli adiposæ*, or *appendices epiploicæ*.

Rectum.

Ques. 83. What is the situation of the rectum ?

Ans. It extends from the last lumbar vertebra to the anus.

Ques. 84. What is its course ?

Ans. It runs in a direct course in the hollow of the os sacrum and os coccygis ?

Ques. 85. In what does the rectum terminate ?

Ans. Its external termination is called the anus.

Ques. 86. How does the membranous coat of this intestine differ from that of the other intestines ?

Ans. It often contains a great quantity of fat.

Ques. 87. How does its muscular coat differ from that of the other intestines ?

Ans. Its muscular coat is thicker, and its longitudinal fibres stronger.

Ques. 88. How does its nervous and villous coats differ from that of the other intestines ?

Ans. Its nervous and villous coats are larger, and form numerous rugæ.

Ques. 89. How are these rugæ arranged ?

Ans. Towards the anus they become longitudinal, and towards the inner margin of the anus they form little bags, the openings of which are turned upward.

Ques. 90. Is the rectum supplied with glands ?

Ans. Yes ; it has a great number of mucous glands.

Mesentery.

Ques. 91. How is the mesentery formed ?

Ans. It is formed by two layers of the peritoneum, which separate at the loose or folded edge to surround the intestines.

Ques. 92. Into what parts is the mesentery divided ?

Ans. That part which supports the small intestines retains the name of mesentery : that which fixes the large intestines is called meso-colon.

Ques. 93. Where does the mesentery begin ?

Ans. It begins at the last incurvation of the duodenum.

Ques. 94. What is its course ?

Ans. It passes obliquely from left to right along the vertebræ of the loins.

Ques. 95. What is its form ?

Ans. It is narrow at its upper and lower parts, but chiefly at its upper part ; while the middle portion is very broad, and its intestinal edge much plaited.

Ques. 96. How are its laminæ connected ?

Ans. They are connected together by cellular substance.

Ques. 97. What is contained between the laminæ of the mesentery ?

Ans. Numerous lymphatics, arteries, veins, nerves, and glands.

Ques. 98. What is the meso-colon ?

Ans. It is a continuation of the mesentery to support the large intestines.

Ques. 99. Where does it commence ?

Ans. At the extremity of the ilium.

Ques. 100. Where is the ligamentum coli dextrum situated ?

Ans. At the commencement of the meso-colon, under the right kidney.

Ques. 101. How is it formed ?

Ans. By a small transverse fold of the mesentery.

Ques. 102. What is the course of the meso-colon after the formation of the ligamentum dextrum ?

Ans. After the formation of the ligamentum dextrum, the meso-colon ascends towards the right kidney, where it almost disappears by the adhesion of the colon to that kidney and to the first turn of the duodenum ; appearing again, it increases in breadth, and passes transversely under the liver, stomach, and spleen, including the great arch of the colon ; it then turns downward toward the left kidney.

Ques. 103. Where does the meso-colon form the ligamentum coli sinistrum ?

Ans. Below the left kidney it again becomes short, and forms the ligamentum coli sinistrum.

Ques. 104. What is the course of the meso-colon after it forms the ligamentum coli sinistrum?

Ans. It widens, but less than in the upper part, and ascends on the left psoas muscle, and continues on the sigmoid flexure of the colon.

Ques. 105. Where is the meso-rectum situated?

Ans. Between the rectum and os sacrum, at the upper part, it fixes this gut; it is a continuation of the meso-colon.

Liver.

Ques. 106. What is the liver?

Ans. The liver is the largest viscus in the abdomen; it is a solid mass of a dark red colour, inclined to a brownish yellow, whose office it is to secrete the bile.

Ques. 107. Where is it situated?

Ans. It is situated immediately under the diaphragm, partly in the right hypochondrium, which it nearly fills; and partly in the epigastrium, between the spine and ensiforme cartilage, terminating generally in the left hypochondrium.

Ques. 108. What is its form?

Ans. Its figure is irregular, being convex superiorly, unequally concave inferiorly, very thick towards the back and right side; it becomes gradually thin towards the left side, and forms an acute edge anteriorly.

Ques. 109. How is it divided?

Ans. It is divided into three lobes, viz., the great or right lobe, the small or left lobe, and the lobulus spigelii.

Ques. 110. How is the right lobe divided from the left?

Ans. It is divided superiorly by a membranous ligament, and inferiorly by a considerable fissure.

Ques. 111. What is the situation of the lobulus spigelii?

Ans. It is situated on the inferior side of the liver, towards its back part, near the great fissure.

Ques. 112. How many depressions are seen on the under side of the liver?

Ans. Seven.

Ques. 113. What are the depressions of the liver called?

Ans. First, the great fissure; secondly, one for the sinus of the vena portæ; thirdly, one for the vena cavæ; fourthly, a furrow between the left lobe and lobulus spigelii, for a venous canal in the fœtus; fifthly, a depression for the gall bladder; sixthly, a superficial cavity, caused by the stomach; and seventhly, the great sinus, for the spine and œsophagus, at the posterior part of the left lobe.

Ques. 114. Where is the great fissure of the liver situated?

Ans. It runs from behind forward, on the inferior side of the liver, between its two lobes.

Ques. 115. Where is the sinus of the vena portæ?

Ans. It is placed transversely between the eminences on the inferior surface of the great lobe.

Ques. 116. Where is the sinus of the vena cava.

Ans. It is situated posteriorly at the extremity of the great fissure, between the great lobe and lobulus spigelii.

Ques. 117. Where is the depression for the gall bladder?

Ans. It is situated on the fore part of the inferior surface of the great lobe.

Ques. 118. How many ligaments does the liver possess?

Ans. It is kept in its situation by five ligaments.

Ques. 119. What are the names of the ligaments of the liver?

Ans. The broad ligament, the round ligament, the right and left lateral ligament, and the coronary ligament.

Ques. 120. How are the ligaments of the liver formed?

Ans. The broad, and the right and left ligaments, are continuations or duplicatures of the peritoneum; the round ligament was the umbilical vein of the fœtus, and the coronary ligament is merely a broad adhesion.

Ques. 121. To what does the middle or broad ligament of the liver connect it?

Ans. It divides the right lobe from the left, and connects the liver to the diaphragm, and to the upper and inner part of the sheath of the rectus abdominis obliquely, so as to be nearer the linea alba below than above.

Ques. 122. Where is the round ligament of the liver situated?

Ans. It is the remains of the umbilical vein of the fœtus, and is placed in the anterior edge of the broad ligament; it is fixed to the umbilicus, and enters the great fissure.

Ques. 123. To what do the right and left ligament of the liver connect it?

Ans. They connect it to the cartilages of the false ribs.

Ques. 124. To what does the coronary ligament of the liver connect it?

Ans. It connects it to the right ala of the tendinous portion of the diaphragm.

Ques. 125. What is the structure of the liver?

Ans. It is composed of several kinds of vessels, which by their intertexture form numerous friable corpuscles.

Ques. 126. By what are the vessels of the liver enveloped?

Ans. By a sheath of cellular membrane, called the capsule of the vena portæ, or glissons capsule.

Ques. 127. What are the vessels of the liver?

Ans. They are the hepatic artery, the vena portæ, and the hepatic veins; to which may be added the excretory ducts, and absorbents.

Ques. 128. By what vessels is the blood carried to the liver?

Ans. The hepatic artery and vena portæ.

Ques. 129. Of what use is the hepatic artery?

Ans. It is the nutrient artery of the liver.

Ques. 130. What is the use of the vena portæ?

Ans. It acts both as a vein and artery; as a vein, it receives the blood from most of the abdominal viscera; as an artery, it ramifies through the liver, and then secretes the bile.

Ques. 131. How many great branches are generally given off by the vena portæ?

Ans. It gives off five principal branches.

Ques. 132. In what do the ramifications of the vena portæ terminate?

Ans. The terminations of its branches are in villous follicles, or acini, as they have been called.

Ques. 133. What is the use of these folliculi or acini?

Ans. The bile is secreted in them.

Ques. 134. What is the name of the small excretory ducts of the hepatic folliculi?

Ans. They are called pori biliarii.

Ques. 135. In what do the pori biliarii terminate?

Ans. They terminate in one large duct, called the ductus hepaticus.

Ques. 136. Where does the hepatic duct terminate?

Ans. After joining the duct from the gall bladder called the cystic duct, it terminates in the duodenum.

Ques. 137. How is the blood conveyed from the liver?

Ans. The hepatic veins return the blood to the inferior cava.

Ques. 138. Whence does the liver derive its nerves?

Ans. From the great sympathetic and eighth pair.

Ques. 139. What is glissons capsule?

Ans. The vessels, ducts, and nerves, which enter at

the portæ, are previously collected together and surrounded by a peritoneal covering, which is the true glissons capsule.

Gall Bladder.

Ques. 140. What is the gall bladder?

Ans. It is a small bag which contains the bile.

Ques. 141. Where is it situated?

Ans. In the anterior part of the inferior surface of the great lobe of the liver.

Ques. 142. What is its form?

Ans. It is pyriform, but in infants often cylindrical.

Ques. 143. How is it divided?

Ans. It is divided into a body, fundus, and neck.

Ques. 144. How is the gall bladder situated when we stand?

Ans. It lies in a plain, slightly inclined from behind forward, in the erect posture; its fundus being turned forward.

Ques. 145. How many coats does the gall bladder possess?

Ans. It has four.

Ques. 146. What is peculiar to the internal coat?

Ans. The internal or villous coat is thrown into numerous minute folds, arranged in a beautiful reticular form, filled with small lacunæ, or ducts of follicles, especially near its neck; at which place the folds become longitudinal, and form a kind of small pylorus.

Ques. 147. Has the gall bladder any direct connexion with the liver?

Ans. It is connected by vessels and cellular membrane to the liver; but in the human body, no branches from the pori biliarii have been discovered opening into it.

Ques. 148. How is the neck of the gall bladder formed?

Ans. It is formed by the contraction and incurvation of the small extremity.

Ques. 149. What is the internal appearance of the neck of the gall bladder?

Ans. On its internal surface there are several reticular rugæ.

Ques. 150. What is the course of the cystic duct?

Ans. It proceeds from the neck of the gall bladder, runs near the hepatic duct, and then joins it.

Ques. 151. What duct is formed by the union of the hepatic and cystic ducts?

Ans. The ductus communis choledochus.

Ques. 152. Where does the ductus communis choledochus terminate?

Ans. It terminates, in common with the pancreatic duct, on the inside of the duodenum.

Ques. 153. What is the course of the bile?

Ans. It is secreted by the extremities of the vena portæ in the acini; passes through the pori biliarii and branches of the hepatic duct; by this duct it is conveyed to the ductus communis choledochus; from whence, in part, it passes by the cystic duct to the gall bladder: when needed in the intestine, it returns by the cystic duct and mixes in the ductus communis choledochus with fresh bile from the hepatic duct; and lastly, passes into the duodenum.

Pancreas.

Ques. 154. What is the pancreas?

Ans. It is a long, flat, glandular body, of a grayish white colour.

Ques. 155. What is its situation?

Ans. It is placed at the back part of the epigastric region, transversely under the stomach, and before the spine, the crura of the diaphragm, the aorta, and vena cava.

Ques. 156. How is the pancreas generally divided ?

Ans. Into a superior and an inferior edge, an anterior and a posterior side, a large and a small extremity.

Ques. 157. With what parts are its extremities connected ?

Ans. Its large or right extremity is connected to the second incurvation of the duodenum, and its lesser extremity to the omentum, near the spleen.

Ques. 158. Where is that part situated which has been termed the lesser pancreas ?

Ans. At the lower part of the great extremity, where it is connected with the duodenum.

Ques. 159. Where does the duct of the lesser pancreas terminate ?

Ans. It passes into the extremity of the duct of the greater pancreas, although sometimes it has a separate opening into the duodenum.

Ques. 160. How does the pancreatic duct arise ?

Ans. From numerous small branches ; it is nearly transparent.

Ques. 161. What is the situation of this duct ?

Ans. It is placed horizontally with the substance of the gland, toward the middle of its inferior edge.

Ques. 162. Where does it terminate ?

Ans. Along with the ductus communis choledochus in the duodenum.

Ques. 163. What is the structure of the pancreas ?

Ans. It consists of a great number of small glandular particles connected loosely together ; it resembles the salivary glands.

Ques. 164. Whence does it derive its arteries ?

Ans. From the pyloric and duodenal, but chiefly from the splenic artery.

Ques. 165. Whence does its veins pass ?

Ans. They pass into the splenic vein.

Ques. 166. From whence does it derive its nerves ?

Ans. From the great sympathetic and eighth pair.

Spleen.

Ques. 167. What is the spleen ?

Ans. It is a soft sponge-like fleshy purple mass.

Ques. 168. Where is it situated ?

Ans. In the left hypochondrium, at the large extremity of the stomach.

Ques. 169. What is its shape ?

Ans. It is somewhat of an oval form.

Ques. 170. Into what parts is it generally divided ?

Ans. It has an external surface, uniformly convex ; an internal surface, divided by a groove into two concavities ; the anterior opposed to the stomach, the posterior to the colon and left kidney ; two edges, often notched ; and two extremities.

Ques. 171. What is its structure ?

Ans. It appears to be of cellular structure, but it is probably a congeries of blood vessels.

Ques. 172. From whence does it receive its blood ?

Ans. From the splenic artery, which is a branch of the cœliac ?

Ques. 173. Whence do its veins pass ?

Ans. To the vena portæ.

Ques. 174. From whence does it derive its nerves ?

Ans. From the great sympathetic and eighth pair.

Ques. 175. What is its use ?

Ans. This has been a matter of great contention ; some think that it contributes towards the process of assimilation, first, by its capacity to receive various quantities of blood, and secondly by effecting some change on it ; others, that it is subservient in its functions to those of the liver ; Hewson, that it is necessary to the elaboration of the globules of the blood ; again, there are some who

believe that it is subordinate to the stomach in the process of digestion. It probably performs many or all of these functions.*

Omentum.

Ques. 176. What is the omentum?

Ans. It is a large duplicature of the peritoneum.

Ques. 177. What is its situation?

Ans. It hangs loosely before the small intestines.

Ques. 178. What is its form?

Ans. It resembles a flat bag, whose sides are in contact.

Ques. 179. Where is it attached?

Ans. Its mouth or opening is attached to the great curvature of the stomach, and to the arch of the colon, and may be separated by inflation.

Ques. 180. What is its structure?

Ans. It consists of two laminæ connected by cellular substance, between which there are numerous portions of fat.

Ques. 181. What is the situation of the little omentum?

Ans. It is fixed to the small curvature of the stomach, and to the concave side of the liver.

Ques. 182. How does the cavity of the omentum communicate with the abdomen?

Ans. It communicates with the abdomen on the right side only, under glissons capsule, by a semilunar orifice, called the foramen of Winslow.

Kidneys.

Ques. 183. What are the kidneys?

Ans. They are two glandular bodies, of a red colour, destined to secrete the urine.

* May it not furnish the bile contained in the gall bladder by some duct not yet discovered? The bile of that reservoir being of different appearance and constitution than that of the hepatic bile.

Ques. 184. What is their situation ?

Ans. They are situated on the posterior part of the abdomen, on each side of the lumbar vertebræ, between the last false rib and ossa ilia.

Ques. 185. What is the difference in the situation of the right and left kidney ?

Ans. The right kidney lying under the great lobe of the liver is lower than the left, which lies under the spleen.

Ques. 186. What is the form of the kidney ?

Ans. It somewhat resembles the form of a large bean ; its circumference is convex on the outer side, and concave on the inner ; the posterior side is broader and flatter than the fore side, and the upper extremity is more incurvated and larger than the lower.

Ques. 187. What coats does the kidney possess ?

Ans. They have no peritoneal investment, but they are every where surrounded by a proper coat, which consists of two laminæ, of which the external is thin and adheres to the internal ; this penetrates the substance of the kidney every where by numerous elongations.

Ques. 188. What is the structure of the kidney ?

Ans. It consists of two substances, namely, an external termed cortical substance, and an internal named medullary substance.

Ques. 189. How may the cortical and medullary substances be distinguished from each other ?

Ans. The medullary substance is of a much paler colour, and more dense texture than the cortical ; it is divided into a number of unequal conical portions, which terminate in nipple projections, called papillæ, or mammillary processes.

Ques. 190. What is the number of the papillæ ?

Ans. They vary in number from eight to twelve, or more.

Ques. 191. What is the name of the cavities in which the papillæ are situated ?

Ans. Each papillæ is situated in a small funnel-like cavity, called calix or infundibulum.

Ques. 192. What is the name of the cavity in which the calices or infundibula of the kidney terminate ?

Ans. The infundibula join and form two or three tubes, which ultimately form a large conical cavity, called the pelvis of the kidney ; it is placed in part within, but more without the body of the kidney, and is the commencement of the duct of the kidney.

Ques. 193. What is the name of the duct leading from the pelvis of the kidney ?

Ans. The ureter.

Ques. 194. What is the course of the ureter ?

Ans. It descends, obliquely and slightly inflected, from the kidney to the sides of the anterior part of the os sacrum ; and passing between the rectum and bladder terminates in the last of these viscera.

Ques. 195. How many coats has the ureter ?

Ans. Three.

Ques. 196. What is the structure of the coats of the ureter ?

Ans. The external consists of a compact filamentary substance ; the middle one of several strata or fibres ; and the internal one is of the mucous kind.

Ques. 197. Whence are the arteries of the kidneys derived ?

Ans. The artery of the kidneys which is called the emulgent, comes directly from the aorta.

Ques. 198. Whence do the veins of the kidney pass ?

Ans. The veins which are called the emulgent veins pass to the inferior cava.

Ques. 199. Whence are the nerves derived ?

Ans. From the great sympathetic and eighth pair.

Ques. 200. What is the situation of the ureter in relation to the emulgent artery and vein ?

Ans. The emulgent artery and vein, and the ureter, enter the kidney at its inner edge, the artery being uppermost; the pelvis, and beginning of the ureter, behind and below the blood vessels.

Renal Glands.

Ques. 201. What are the renal glands?

Ans. They are two small, flat, dark yellow-coloured bodies.

Ques. 202. Where are they situated?

Ans. Immediately above the kidneys, on which they rest.

Ques. 203. What is the shape of these glands?

Ans. Each gland is of an oblong, irregular, three-sided figure.

Ques. 204. What is the internal appearance of these glands?

Ans. A cavity is found within them.

Ques. 205. What is the form of this cavity?

Ans. It is of a narrow and triangular figure.

Ques. 206. What is contained in these cavities?

Ans. They are full of strong, yellow villi, and a dark bile-like fluid.

Ques. 207. Are these glands largest in the fœtus or adult?

Ans. They are much larger in the fœtus.

SECTION XXIX.

OF THE PELVIC VISCERA.

Ques. 1. Of what are the pelvic viscera generally said to consist?

Ans. Under this head is comprised the urinary bladder, rectum, and parts of generation.

Urinary Bladder.

Ques. 2. What is the urinary bladder?

Ans. It is a large membranous bag, which serves as a reservoir for the urine.

Ques. 3. What is its situation?

Ans. It is placed in the lower part of the abdomen, and front of the pelvis, immediately behind the symphysis pubis, above and before the lower part of the rectum.

Ques. 4. What is its form?

Ans. It is somewhat oviform, rounder above than below when empty, and broader below than above when full.

Ques. 5. What parts of the urinary bladder are generally enumerated?

Ans. It is divided into a body, a neck turned downward and forward, and a fundus turned upward.

Ques. 6. How many coats has the bladder?

Ans. Four.

Ques. 7. What are their names?

Ans. An external or peritoneal, a muscular, a cellular, commonly called nervous, and a villous or mucous coat.

Ques. 8. What is the extent of the peritoneal coat?

Ans. It only covers the fundus, sides, and back part, to a little within the termination of the ureters.

Ques. 9. What is the direction of the fibres of the muscular coat ?

Ans. They are collected into distinct bundles : the external ones are mostly longitudinal ; the middle ones are inclined to each side ; and the internal ones become more and more oblique ; thus crossing each other in various directions.

Ques. 10. What is the nature of the cellular or nervous coat ?

Ans. It nearly resembles in situation and use the tunic, of the same name, in the stomach and intestines.

Ques. 11. What is the structure of the internal coat ?

Ans. It is of firm texture, though not thick ; it is thrown into folds or rugæ, when the bladder is empty.

Ques. 12. How many openings are there into the bladder ?

Ans. There are three, situated at the under part.

Ques. 13. What is the anterior opening ?

Ans. The beginning of the urethra, surrounded by the neck of the bladder.

Ques. 14. What is termed the neck of the bladder ?

Ans. It is an elongation of the proper coats of the bladder, terminating in the inferior orifice.

Ques. 15. Where do the ureters open into the bladder ?

Ans. At the posterior part.

Ques. 16. At what distance are these openings from each other ?

Ans. Passing obliquely through the coats of the bladder, they open an inch and a half from each other, and from the urethra.

Ques. 17. Where is the urachus ?

Ans. At the top of the bladder, above the symphysis pubis ; it ascends between the peritoneum and linea alba to the umbilicus.

Ques. 18. What is the use of the urachus ?

Ans. In the fœtus it is hollow, but its use is not understood.

Ques. 19. Whence are the arteries of the bladder derived ?

Ans. From the internal iliac.

Ques. 20. Whence do its veins pass ?

Ans. To the internal iliac veins.

Ques. 21. Whence are its nerves derived ?

Ans. From the sacral and great sympathetic.

Male Organs of Generation.

Ques. 22. Of what parts do the male organs of generation consist ?

Ans. They consist of the testicles, with the epididymis, and vasa deferentia, contained in the scrotum ; the vesiculæ seminales, prostate gland, Cowper's glands, and veru montanum, about the neck of the bladder ; and lastly, the penis, composed of the corpora cavernosa, corpus spongiosum, glans penis, and urethra.

Scrotum.

Ques. 23. How is the scrotum formed ?

Ans. It is a loose bag, formed merely by a continuation of the integuments ; it is devoid of fat.

Ques. 24. What is the raphe ?

Ans. It is a projecting line, which divides it into two equal parts.

Ques. 25. What is the dartos ?

Ans. The cellular substance on the inside of the scrotum is fibrous, and of a red colour ; it has therefore by some been thought muscular, and called dartos.

Ques. 26. What is the septum scroti ?

Ans. Loose cellular substance every where connects the testicles to the scrotum, and forms a septum between them.

Testes.

Ques. 27. What are the testes ?

Ans. They are two glandular bodies of an oval figure, which secrete the semen, and are contained in the scrotum.

Ques. 28. How many coats has the testicles ?

Ans. Each testicle has two coats, viz., the tunica vaginalis, and the tunica albuginea.

Ques. 29. Describe the tunica vaginalis.

Ans. It surrounds the testicle as the pericardium does the heart, adhering only at its posterior and superior part ; its internal surface is lubricated by a serous fluid.

Ques. 30. What is the tunica albuginea ?

Ans. It firmly invests the testicle, and gives it support and form.

Ques. 31. What is the internal structure of testes ?

Ans. When the tunica albuginea is opened, the testicle is seen to consist of an immense number of whitish tubes, called tubuli seminiferi, folded in various ways, and distributed in different fasciculi between membranous septa ; the septa are disposed longitudinally, diverging from the posterior edge of the testicle, form a white body, which may be termed the nucleus of the testicle ; at this nucleus the tubuli seminiferi terminate in common trunks, forming the rete testes, which afterwards penetrate the upper part of the anterior extremity of the testes, and are called the vasa efferentia.

Epididymus.

Ques. 32. What is the epididymus ?

Ans. It is an oblong, flattened body, situated along the lateral external part of the upper edge of the testicle as far as its posterior extremity, from the common trunks of the tubuli seminiferi or vasa efferentia ; it in some

measure resembles a flat arch, slightly concave on the under side, and irregularly convex on the upper side.

Ques. 33. What is the course of the epididymus ?

Ans. Its anterior extremity, called its head, arises from the testicle, and receives the vasa efferentia ; its posterior extremity or cauda, which also adheres, becomes gradually smaller ; the whole appears composed of one convoluted tube.

Ques. 34. Where does it terminate ?

Ans. In the excretory duct of the testicle called the vas deferens.

Vas Deferens.

Ques. 35. What is the vas deferens ?

Ans. It is the excretory duct of the testicle, and is a small white tube of dense structure.

Ques. 36. Whence does it arise ?

Ans. It arises from the epididymus.

Ques. 37. What is its course ?

Ans. It forms, in common with the blood vessels and nerves of the testicle, the spermatic cord, in the cellular substance, of which it ascends to the abdominal ring, being situated behind the vessels ; having reached the peritoneum, it separates from the vessels and runs back, in a curved direction, through the cellular substance of the peritoneum, descends to the nearest side of the bladder, then passes behind it, covered by its peritoneal coat ; it afterwards continues its course towards the neck of the bladder, where it terminates near its fellow. In this course it crosses the umbilical artery and the extremity of the ureter, passing behind the former, and between the latter and the bladder.

Vesiculæ Seminales.

Ques. 38. What are the vesiculæ seminales ?

Ans. They are two oblong membranous reservoirs.

Ques. 39. What is their situation?

Ans. They are situated obliquely at the lower and under part of the bladder, and before the rectum; near each other anteriorly, but distant behind.

Ques. 40. What is their structure?

Ans. They are formed by a convolution of one tube, whose doublings are closely connected together.

Ques. 41. What is their internal appearance?

Ans. Internally they appear to be composed of cells.

Ques. 42. What is their external covering?

Ans. They are covered and connected to the bladder and other surrounding parts by cellular membrane.

Ques. 43. What is the nature of their internal coat?

Ans. It is a villous secreting membrane.

Ques. 44. How are they connected with the vasa deferentia?

Ans. The vasa deferentia, becoming larger, run between the continuous extremities of the vesiculæ seminales; and the termination of each is partly formed by the contiguous vesicula, so that these extremities communicate on each side.

Ques. 45. Where do the vesiculæ seminales open?

Ans. Each vesicle, after joining the contiguous vas deferens, pierces the prostate gland, and opens into the urethra.

Ques. 46. What is their use?

Ans. They secrete a peculiar fluid, but are not thought to retain the semen.

Prostate Gland.

Ques. 47. What is the prostate gland?

Ans. It is a firm glandular body.

Ques. 48. Where is it situated?

Ans. At the neck of the bladder and beginning of the urethra.

Ques. 49. What is its form?

Ans. It is somewhat of the form and about the size of a chesnut, broad behind, and pointed before.

Ques. 50. What are its connections with the surrounding parts?

Ans. Its basis is turned towards the bladder, its apex towards the urethra, its inferior surface is convex, and connected to the rectum; through its substance, near the superior surface, the urethra passes.

Ques. 51. What is its structure?

Ans. It is of a spongy but very compact texture, consisting of numerous follicles.

Ques. 52. What openings are there from the follicles of the prostate into the urethra?

Ans. Their ducts, which are ten or twelve in number.

Ques. 53. What is its use?

Ans. It secretes a peculiar thin white fluid, which mingles with the semen.

Anti-Prostatæ or Cowper's Glands.

Ques. 54. What are the anti-prostatæ?

Ans. They are two bodies, about the size of a pea.

Ques. 55. Where are they situated?

Ans. Before the prostate, near the bulb of the urethra.

Ques. 56. Where do their ducts open?

Ans. Near the beginning of the urethra.

Ques. 57. What is their use?

Ans. They contribute a fluid which lubricates the urethra.

Veru montanum, or Caput Gallinaginis.

Ques. 58. What is the veru montanum?

Ans. It is a small oblong oval eminence.

Ques. 59. How is it situated?

Ans. It is situated immediately within the prostate, at the under part of the urethra.

Ques. 60. By what is the veru montanum perforated?

Ans. Its summit is perforated by the two orifices of the vesiculæ seminales?

Penis.

Ques. 61. What are the parts which compose the penis?

Ans. The penis consists of the corpora cavernosa, corpus spongiosum, urethra, and glans penis.

Corpora Cavernosa.

Ques. 62. What are the corpora cavernosa?

Ans. They form the body of the penis; they are two large ligamentary tubes, firmly united together.

Ques. 63. Where are they situated?

Ans. They are situated by the side of each other.

Ques. 64. What grooves are formed by their union?

Ans. Their junction is marked by two grooves, of which one is superior, the other inferior and much the largest.

Ques. 65. What is situated in the lower groove?

Ans. The corpus spongiosum urethræ.

Ques. 66. What is it situated in the upper groove?

Ans. The vena magna penis.

Ques. 67. To what are the ends of the corpora cavernosa joined anteriorly?

Ans. They terminate anteriorly by a rounded extremity, which is covered by the glans penis; posteriorly, they are entirely separate, forming the crura penis, which are attached to the edge of the ramus of the os ischium and os pubis.

Ques. 68. What is the structure of the corpora cavernosa?

Ans. A dense ligamentous sheet forms their external part; internally, they consist of numerous cells, which freely communicate with each other.

Ques. 69. How are the two corpora cavernosa divided?

Ans. They are internally separated from each other by a particular septum, called pecten, which however is perforated by numerous fissures.

Urethra.

Ques. 70. What is the urethra?

Ans. It is a long membranous canal, extending from the neck of the bladder to the end of the penis.

Ques. 71. What is its situation?

Ans. It is lodged in the lower groove, between the two corpora cavernosa.

Ques. 72. What is its form?

Ans. It is not throughout of equal bore, being most dilated in the prostate gland, again an inch and a half before it, and lastly just before its external orifice.

Ques. 73. What is its structure?

Ans. It is a continuation of the membrane which lines the bladder.

Ques. 74. What are the lacunæ?

Ans. Numerous small openings on its surface leading to minute pouches.

Ques. 75. In what direction are the openings of the lacunæ?

Ans. Their openings are turned forward.

Corpus Spongiosum.

Ques. 76. What is the name of the substance surrounding the urethra?

Ans. It is called the corpus spongiosum urethræ, except at about a finger breadth and a half from its origin at the

bladder, where it is termed the membranous part of the urethræ.

Ques. 77. Where is the membranous part of the urethra situated?

Ans. About an inch of its length before the prostate.

Ques. 78. Where is the bulb of the urethra situated?

Ans. The posterior commencement of the corpus spongiosum is dilated into a conical prominence called the bulb.

Ques. 79. Where is the glans penis situated?

Ans. It expands over the ends of the corpora cavernosa.

Ques. 80. By what is the glans penis perforated?

Ans. It is perforated anteriorly by the orifice of the urethræ.

Ques. 81. Where is the corona glandis?

Ans. It is a prominent edge, situated posteriorly.

Ques. 82. What is the structure of the corpus spongiosum?

Ans. It is composed of a congeries of veins.

Ques. 83. Whence are the arteries of the penis derived?

Ans. From the internal pudic.

Ques. 84. What is the course of the veins of the penis?

Ans. They receive the blood from the cells of the corpora cavernosa; they then form the corpus spongiosum, which is an extensive plexus of veins; from this several branches pass to the dorsum penis, and join the vena magna penis; this passes under the arch of the pubis, where it opens into another considerable plexus which surrounds the prostate and neck of the bladder; and finally the hypogastric veins receive the blood.

Ques. 85. How is the erection of the penis effected?

Ans. The arteries, acting with increased velocity, distend the corpora cavernosa with blood, where it is retained on account of the peculiar construction of the veins through whose plexus it flows slowly.

Integuments of the Penis.

Ques. 86. What are the integuments of the penis ?

Ans. The common integuments, devoid of fat, afford a loose and very moveable covering to the penis, except on the glans, where they are very firmly adhering, and of much more delicate structure.

Ques. 87. What is the præputium ?

Ans. Immediately behind the corona glandis the integuments form a loose doubling, called the præputium, which in the unerected state cover the glans.

Ques. 88. What is the frænum ?

Ans. A fold of the præputium at the upper part of the glans.

Female Organs of Generation.

Ques. 89. How are the parts of generation in females divided ?

Ans. They are divided into external and internal parts.

Ques. 90. What are the internal parts ?

Ans. The uterus, and its appendages, viz., the fallopian tubes, ovaria, spermatic vessels, ligamentum lata, ligamentum rotunda, and the vagina.

Ques. 91. What are the external parts ?

Ans. They are the pubis, labia pudendi, the nymphæ, the clitoris, the orifice of the urethra, and the orifice of the vagina.

INTERNAL PARTS.

Uterus.

Ques. 92. What is the uterus ?

Ans. It is a hollow, fleshy viscus, destined to retain and nourish the fœtus.

Ques. 93. What is its situation ?

Ans. It is placed between the bladder and rectum.

Ques. 94. What is its form ?

Ans. It is somewhat of the figure of a flat flask, about three fingers' breadth in length, one in thickness, two in breadth at one end, and scarcely one at the other.

Ques. 95. What are its divisions ?

Ans. It is divided into its fundus, or upper part ; body, or middle ; cervix, or neck, which is turned downward.

Ques. 96. What is the form of the uterine cavity ?

Ans. It is small, owing to the great thickness of its sides ; it is flat, and resembles an oblong triangle, the shortest side of which corresponds to the fundus, and the two longest sides toward each hand ; while all of them bend inward to the cavity which they form.

Ques. 97. What openings are there into the cavity of the uterus ?

Ans. There are three openings ; two at the angles of its fundus, and one at its neck.

Ques. 98. What are the openings of its fundus ?

Ans. They lead to the fallopian tubes.

Ques. 99. What is their size ?

Ans. They are extremely small, hardly admitting a bristle.

Ques. 100. Whither does the opening at its neck lead ?

Ans. To the vagina.

Ques. 101. What is its size ?

Ans. It is wider than those at its fundus, and of a flat form ?

Ques. 102. What is the name generally given to this opening ?

Ans. It is called the internal orifice of the uterus, os uteri, or os tinæ.

Ques. 103. How is the uterus lined ?

Ans. By a very fine membrane.

Ques. 104. In what part of the uterus does this membrane form rugæ ?

Ans. In the neck which leads to the os tinæ.

Ques. 105. By what small foramina is the os uteri surrounded ?

Ans. The openings of many follicles are seen about the os uteri.

Ques. 106. What is the internal structure of the uterus ?

Ans. It is of a spongy, yet compact structure, with an intertexture of numerous vessels.

Ques. 107. By what membrane is the uterus covered externally ?

Ans. By a portion of peritoneum, continued from that which covers the bladder and rectum.

Ques. 108. How are the broad ligaments of the uterus formed ?

Ans. The laminæ of the portions of peritoneum which cover the uterus, meeting on each side, form two duplicatures, called the broad ligaments or ligamenta lata.

Ques. 109. What is their situation ?

Ans. They pass from the edges of the uterus to the sides of the cavity of the pelvis, thus transversely dividing it into two, an anterior and a posterior cavity.

Ques. 110. What are the alæ of the broad ligaments ?

Ans. The two-fold superior edges of the ligamenta lata.

Ques. 111. What is contained between the laminæ of the broad ligaments ?

Ans. The fallopian tubes, the ovaria, some of the spermatic vessels, the round ligaments, and nerves.

Ques. 112. What are the round ligaments of the uterus?

Ans. They are two long cords, which arise from the superior part of the sides of the uterus; they pass between the laminae of the ligamenta lata, and then forward toward the abdominal ring, through which they pass to the pubis, where they are fixed.

Ovaria.

Ques. 113. What are the ovaria?

Ans. They are two oval, oblong, flat bodies, in which the rudiments of the foetus are supposed to be formed.

Ques. 114. What is their situation?

Ans. They are placed in the duplicature, called the posterior pinion of the ligamenta lata, near the fundus of the uterus.

Ques. 115. How are they connected to the uterus?

Ans. In addition to the broad ligaments, two short round ligaments attach them to the uterus.

Ques. 116. What is their internal structure?

Ans. They consist of a compact spongy substance and of several small transparent vesicles, called ova, which contain a glairy fluid.

Fallopian Tubes.

Ques. 117. What are the fallopian tubes?

Ans. They are two small worm-like tubes, which receive the rudiments of the foetus from the ovaria, and convey them to the uterus.

Ques. 118. Where are they situated?

Ans. They proceed from the angles at the fundus uteri towards the lateral parts of the pelvis, being included in the anterior pinions of the ligamenta lata.

Ques. 119. What is the size of their cavity ?

Ans. They hardly admit a large bristle into their cavities at the opening into the uretus, but they become gradually larger toward the opposite extremities, which would admit a goose-quill.

Ques. 120. How do they terminate ?

Ans. They expand in the form of a membranous fringe, called *fimbriæ*.

Ques. 121. What is their direction ?

Ans. Towards the ovaria.

Ques. 122. With what are the fallopian tubes connected ?

Ans. They are loose and unconnected, except when under the influence of impregnation, they expand and embrace the ovaria.

Ques. 123. How are these tubes lined ?

Ans. By a very fine membrane, which is thrown into longitudinal folds.

Ques. 124. What is their structure ?

Ans. It seems to be spongy, somewhat resembling that of the uterus.

Vagina.

Ques. 125. What is the vagina ?

Ans. It is a large fleshy tube, extending from the cervix uteri to the external parts.

Ques. 126. Where is it situated ?

Ans. It is placed behind and below the bladder and urethra, before and above the termination of the rectum.

Ques. 127. Where does the os uteri project into the vagina ?

Ans. At its upper part.

Ques. 128. To what part of the uterus is the vagina attached ?

Ans. It is fixed to the neck of the uterus.

Ques. 129. With what parts is the vagina connected anteriorly ?

Ans. It is firmly united to the urethra, and a more loose cellular membrane connects it with the bladder.

Ques. 130. Where is it connected with the rectum ?

Ans. Posteriorly at its lower part, by cellular substance.

Ques. 131. Where has it a peritoneal covering ?

Ans. At its upper and posterior part.

Ques. 132. What is its structure ?

Ans. Its substance is thick and strong ; it is lined internally by a mucous membrane, which is thrown into numerous rugæ.

Arteries, Veins, and Nerves of the Uterus, &c.

Ques. 133. How is the uterus supplied with arteries ?

Ans. By the hypogastric arteries, the ovaria by the spermatic arteries.

Ques. 134. Whither do the veins of the uterus, fallopian tubes, and ovaria pass ?

Ans. They correspond in name and distribution with the arteries.

Ques. 135. Whence are the nerves of the uterus, fallopian tubes, and ovaria derived ?

Ans. They receive their nerves from the lumbar, sacral, and sympathetic nerves.

EXTERNAL PARTS.

Pubis.

Ques. 136. What is the name of the external parts taken collectively ?

Ans. They are called the pudendum or vulva.

Ques. 137. What is the pubis or mons veneris ?

Ans. It is that broad eminence, at the lower part of the hypogastrium, between the two groins, which, at the age of puberty, is covered with hair.

Ques. 138. How is the pubis formed?

Ans. Its hairy integuments are made prominent by a particular thickness of the adipose membrane covering the fore part of the ossa pubis.

Labia Pudendi.

Ques. 139. What is the situation of the labia pudendi?

Ans. They reach from the middle of the lower part of the pubis to within an inch of the anus.

Ques. 140. What are the points in which the labia meet termed?

Ans. They are called commissures.

Ques. 141. What is the structure of the labia?

Ans. They are formed by a large longitudinal fold of integuments, containing cellular substance and fat; externally they are covered with hair; but the sides, which are turned towards each other, are smooth and lubricated.

Ques. 142. What is the space between the inferior commissure of the labia and anus called?

Ans. The perineum.

Ques. 143. What is the length of the perineum?

Ans. It measures about a large finger's breadth.

Ques. 144. What parts are seen, when the labia are separated?

Ans. On separating the labia the following parts appear: two longitudinal folds called nymphæ; at the angle formed superiorly by their junction a small fleshy body, called clitoris; under this the opening of the urethra; more inferiorly the opening of the vagina; between which and the inferior commissure a depression, called fossa navicularis.

Nymphæ.

Ques. 145. What are the nymphæ ?

Ans. They are two folds of the inner skin of the labia ?

Ques. 146. What is their situation ?

Ans. They are situated internal to the labia, and take nearly the same direction.

Ques. 147. What is their shape ?

Ans. They are narrow at their upper part, become broader as they descend, and contract at their lower extremity.

Ques. 148. What is their structure ?

Ans. They consist of a spongy cuticular substance, intermixed with follicles.

Ques. 149. Which of the extremities is most distant ?

Ans. Their lower extremities are distant from each other, their upper unite around the clitoris.

Clitoris.

Ques. 150. What is the clitoris ?

Ans. It is an oblong firm projecting body.

Ques. 151. What is its situation ?

Ans. It is situated immediately under the superior commissure of the labia.

Ques. 152. By what is it enveloped ?

Ans. A duplicature of the internal membrane, called its præputium, surrounds it at the beginning of the nymphæ.

Ques. 153. What is its structure ?

Ans. It consists, like the penis, of two corpora cavernosa united together, anteriorly forming the glands, and divided posteriorly into two crura.

Ques. 154. Where are its crura fixed ?

Ans. They are attached to the rami of the ossa pubis.

Ques. 155. What is the use of the clitoris ?

Ans. It is capable of erection, which is effected in the same manner as in the penis, and it is supposed to be the chief seat of sensation in coition.

Urethra.

Ques. 156. Where is the urethra situated in females?

Ans. Between the nymphæ and below the clitoris, just above the vagina.

Ques. 157. What appearances have the sides of the orifice of the urethra?

Ans. The orifice is slightly prominent and wrinkled.

Ques. 158. Where are the lacunæ of the urethra situated.

Ans. On the edges of its orifice; there are also some internally.

Ques. 159. What is the structure of the female urethra?

Ans. It is a membranous tube of the same structure as in males.

Ques. 160. How is the female urethra distinguished from the male?

Ans. It is not more than an inch in length, but it is wide; it has no prostate gland.

Orifice of the Vagina.

Ques. 161. What is the situation of the orifice of the vagina?

Ans. It is placed immediately below the urethra, and above the fossa navicularis.

Ques. 162. Is the orifice narrower than the rest of the vagina?

Ans. It is.

Ques. 163. What is particularly noticed in its under part ?

Ans. A delicate membrane, called the hymen.

Hymen.

Ques. 164. What is the hymen ?

Ans. It is a delicate membranous fold, of a semilunar form, whose cornua are turned upwards.

Ques. 165. What part of it is pervious ?

Ans. It does not completely close the vagina, being defective towards the urethra.

Ques. 166. What are the carunculæ myrtiformes ?

Ans. When the hymen is torn in coitre, or otherwise, the remains form little small fleshy eminences, which are called carunculæ myrtiformes.

Ques. 167. What is the use of the hymen ?

Ans. Its use is not evident ; it is not, as has been supposed, a test of virginity.

ORGANS OF THE SENSES.

Ques. 1. What are the organs of the senses ?

Ans. They are parts constructed to receive impressions from all external objects.

Ques. 2. What are the names of the organs of the senses ?

Aus. They are five in number, viz., first, for the sense of sight, the eyes ; secondly, for the sense of smell, the nose ; thirdly, for the sense of hearing, the ears ; fourthly, for the sense of taste, the mouth and tongue ; fifthly, for the sense of feeling, the skin.

SECTION XXX.

ORGAN OF VISION.

Ques. 1. Of what does the organ of vision consist ?

Ans. The organ of vision is two-fold, there being two eyes.

Ques. 2. Where are the eyes situated ?

Ans. They are situated in the orbits, surrounded by muscles, which move them, and an apparatus for tears ; these parts are called the appendages of the eye.

Orbits.

Ques. 3. What are the orbits ?

Ans. They are two conical, or funnel-like cavities.

Ques. 4. Where are they situated ?

Ans. On each side of the nose, just below the forehead ; their bases are turned forward, and obliquely outward.

Ques. 5. Of how many bones is the orbit composed ?

Ans. Each orbit is composed of parts of seven bones.

Ques. 6. What are the names of the bones which compose the orbit ?

Ans. The os frontis, os sphœnoides, os æthmoides, os maxillare superius, os malæ, os lachrymale, and os palati.

Ques. 7. What bones form its ridge or basis ?

Ans. The os frontis, os maxillare superius, and os malæ.

Ques. 8. What bones form its apex ?

Ans. The os sphœnoides, and os palati.

Ques. 9. What bones form the sides of the orbit ?

Ans. The os frontis above, the superior maxillary bone and the os malæ below, the os lachrymale and os æthmoides towards the nose, and the os sphœnoides towards the temple complete its sides.

Ques. 10. By what foramina is the orbit perforated ?

Ans. By three, viz., the foramen opticum, the fissura sphœnoidalis, and the fissura sphæno-maxillaris.

Ques. 11. In what part of the orbit is the foramen opticum ?

Ans. It is a large round hole at the apex.

Ques. 12. Where is the sphœnoidal fissure, or foramen lacerum orbitale superius ?

Ans. It is situated at the upper part of its external side.

Ques. 13. Where is the sphæno-maxillary fissure, or foramen lacerum orbitale inferius ?

Ans. It is situated at the lower part of its external side.

Ques. 14. From whence is the lining membrane of the orbit derived ?

Ans. From the dura mater, and periosteum of the face.

LACHRYMAL AND EXTERNAL PARTS OF THE EYE.

Supercilia or Eye-brows.

Ques. 15. Where are the supercilia situated ?

Ans. Upon the superciliary ridge of the frontal bone.

Ques. 16. How are they formed ?

Ans. They consist of two arches of hairs, placed upon an additional portion of the adipose membrane.

Ques. 17. How are they moved ?

Ans. By the occipito frontalis, and corrugator supercili muscles.

Palpebræ or Eye-lids.

Ques. 18. Explain the situation of the palpebræ.

Ans. They are placed transversely above and below the anterior portion of the globe of the eye.

Ques. 19. Which is the largest ?

Ans. The superior one ; it is also the most moveable.

Ques. 20. What are the points where the superior and inferior palpebræ meet denominated ?

Ans. The outer and inner canthus.

Ques. 21. Which is the largest ?

Ans. The inner one, or that towards the nose.

Ques. 22. Of what are they composed ?

Ans. They consist of common integuments, of the orbicularis palpebrarum muscle, of the cartilages called tarsi, which contain the ciliary glands, and of the cilia or eye-lashes.

Tarsi.

Ques. 23. What are the tarsi ?

Ans. They are thin cartilages.

Ques. 24. Where are they situated ?

Ans. At the edge, and in the substance of each eye-lid.

Ques. 25. What is their form ?

Ans. They are broader in the middle than at their extremities: the tarsus of the upper eye-lid is the largest.

Ques. 26. Which of the edges of the tarsi are the thickest ?

Ans. Their ciliary edges, which are turned towards each other.

Ques. 27. What is formed by the meeting of the ciliary edges ?

Ans. A small groove, which conducts the tears to the inner canthus.

Ques. 28. What is the appearance of their inner sides ?

Ans. Their internal surface is grooved for the reception of the ciliary glands.

Ciliary Glands.

Ques. 29. What are the ciliary glands ?

Ans. They are glands which secrete an unctuous matter, which lubricates the edges of the eye-lids. They have been called glandulæ meibomianæ.

Ques. 30. Where are they situated ?

Ans. On the inner side of the tarsi.

Ques. 31. What is their form ?

Ans. They appear like numerous white lines, taking a tortuous course to the edge of the eye-lids, where the openings of their ducts may be seen.

Cilia or Eye-lashes.

Ques. 32. What are the cilia ?

Ans. They are rows of pencil-like hairs.

Ques. 33. Where are they situated ?

Ans. On the edges of the eye-lids.

Ques. 34. What is the course of the hairs of the cilia ?

Ans. They diverge ; those of the upper eye-lids turn gradually upward, and those of the lower, which are shorter, take the opposite course.

Ques. 35. Where are they the longest ?

Ans. The middle hairs are longest : they diminish in size towards the corners.

Lachrymal Apparatus.

Ques. 36. What parts compose the lachrymal apparatus ?

Ans. It is composed of the lachrymal gland, which secretes, and of the parts which convey away the tears ; viz., the caruncula lachrymalis, plica semilunaris, puncta lachrymalia, canaliculi lachrymales, lachrymal sac, and ductus ad nasum.

Lachrymal Gland.

Ques. 37. Where is the lachrymal gland situated ?

Ans. In the depression behind and somewhat above the external angular process of the frontal bone.

Ques. 38. What is its form ?

Ans. It is somewhat flattened and divided into two lobes ; the greater of which is most external.

Ques. 39. What is its course ?

Ans. It has several excretory ducts, which descend almost parallel to each other through the substance of

the membrane which lines the upper eye-lid, and pierce it near the superior edge of the tarsus.

Caruncula Lachrymalis.

Ques. 40. What is the caruncula lachrymalis ?

Ans. It is a little red eminence situated between the internal angle of the eye-lids and the ball of the eye.

Ques. 41. What is its structure ?

Ans. It seems to be of a glandular structure.

Ques. 42. What is its use ?

Ans. It secretes a yellowish oily matter, with which the hairs on its surface being coated detain any small bodies that float in the tears ; it also directs and assists the tears in their course.

Ques. 43. Where is the lachus lachrymalis situated ?

Ans. It is a depression between the caruncula lachrymalis, the eye-lids, and eye-ball.

Ques. 44. What is its use ?

Ans. It collects the tears to pass into the puncta lachrymalia.

Plica Semilunaris.

Ques. 45. Where is the plica semilunaris ?

Ans. It is situated between the caruncula lachrymalis and the ball of the eye.

Ques. 46. What is its form ?

Ans. It resembles the figure of a crescent.

Ques. 47. What is the direction of its cornua ?

Ans. They are turned toward the puncta lachrymalia.

Ques. 48. What is its use ?

Ans. It serves to direct the tears towards the puncta.

Puncta Lachrymalia.

Ques. 49. What are the puncta lachrymalia ?

Ans. They are two small orifices situated one on the edge of each eye-lid, very near the inner angles, opposite to the cornua of the plica semilunaris, and precisely opposite to each other.

Ques. 50. How are they formed ?

Ans. A minute cartilaginous circle surrounds them, and a fine membrane lines their orifices.

Ques. 51. What parts of the opposite puncta lachrymalia touch where the eye-lids are closed ?

Ans. Their outer edges.

Ques. 52. What is their use ?

Ans. They suck up the tears, and convey them to the lachrymal ducts.

Canaliculi Lachrymales.

Ques. 53. What are the canaliculi lachrymales ?

Ans. They are two minute canals, sometimes called lachrymal ducts.

Ques. 54. What is their situation ?

Ans. They are placed between the puncta lachrymalia and the lachrymal sac.

Ques. 55. What is their direction ?

Ans. The superior first ascends, then gradually descends ; the inferior first descends, then gradually ascends ; they then meet and form a common tube, which opens into the lachrymal sac.

Lachrymal Sac.

Ques. 56. Where is the lachrymal sac situated ?

Ans. Immediately below the inner canthus of the orbit, in a bony groove, or fossa, on the side of the upper part of the nose.

Ques. 57. How is this groove formed ?

Ans. By the nasal process of the superior maxillary and lachrymal bones superiorly ; and by the os maxillare, lower part of the os lachrymale, and upper portion of the inferior turbinated bone inferiorly.

Ques. 58. What is the form of the lachrymal sac ?

Ans. It is an oblong membranous bag.

Ques. 59. Where is the lachrymal sac crossed by the tendon of the orbicularis palpebrarum ?

Ans. About one fourth of its length is above the tendon of the orbicularis palpebrarum, and the rest below it.

Ques. 60. Where do the lachrymal ducts open ?

Ans. Immediately behind the tendon of the orbicularis.

Ques. 61. Where does the ductus ad nasum commence ?

Ans. It proceeds from its lower part.

Ductus ad Nasum.

Ques. 62: Where is the ductus ad nasum situated ?

Ans. It descends from the lachrymal sac into the nose in a bony groove.

Ques. 63. How is this groove formed ?

Ans. By the inferior part of the os lachrymale, and superior part of the inferior turbinated bone.

Ques. 64. Where does the ductus ad nasum terminate ?

Ans. Underneath and behind the anterior extremity of the inferior turbinated bone.

Ques. 65. What is the course of the tears ?

Ans. They are secreted by the lachrymal gland, and are poured, by its excretory ducts, over the anterior surface of the eye, which, in the movements of the eye-lids, they every where moisten ; the puncta lachrymalia absorb them ; they are conveyed by the lachrymal ducts to the lachrymal sac, and through the ductus ad nasum they pass into the nose.

The Globe of the Eye.

Ques. 66. What is the form of the globe of the eye ?

Ans. It is nearly of a spherical figure.

Ques. 67. Where does it deviate from a true spheroid ?

Ans. Its anterior transparent part projecting somewhat, appears like the section of a lesser sphere.

Ques. 68. Of what is the globe of the eye composed ?

Ans. It is composed of membranes, or coats, filled with humours, or fluids, which prop its form.

Coats of the Eye.

Ques. 69. How many coats has the eye ?

Ans. Six, viz., the tunica conjunctiva, tunica sclerotica, cornea, tunica choroides, iris, and retina.

Ques. 70. How are the coats of the eye generally classed ?

Ans. They are divided into partial and complete coats : the conjunctiva, cornea, and iris belonging to the first ; and the sclerotica, choroides, and retina to the latter class.

Tunica Conjunctiva.

Ques. 71. What is the tunica conjunctiva ?

Ans. It is a very thin transparent membrane, which connects the eye-lids to the globe of the eye, and may be considered as common to both.

Ques. 72. What is its situation ?

Ans. It covers the anterior part of the ball of the eye, and the inner side of the eye-lids.

Ques. 73. How is it divided ?

Ans. Into the conjunctiva palpebrarum, and the conjunctiva oculi.

Ques. 74. How is it connected to the ball of the eye ?

Ans. By cellular membrane.

Ques. 75. Where does it adhere most closely ?

Ans. Over the cornea.

Tunica Sclerotica.

Ques. 76. Where is the tunica sclerotica situated ?

Ans. It is the most external, and by far the most dense coat of the eye ; it envelopes all the ball of the eye, except the portion anteriorly occupied by the cornea ; and posteriorly it is pierced by the optic nerve.

Ques. 77. What is its structure ?

Ans. It is of a firm, ligamentous structure.

Ques. 78. Which part of it is the thickest ?

Ans. Its posterior part.

Ques. 79. Where are the muscles which move the eye-ball attached to this coat ?

Ans. Towards its anterior part.

Cornea.

Ques. 80. What is the cornea ?

Ans. It is the transparent anterior part of the globe of the eye.

Ques. 81. What is its situation ?

Ans. It is firmly connected to the edge of the sclerotica, and appears like a watch-glass fixed in the edge of the case.

Ques. 82. What is its form ?

Ans. It is circular, and more convex than the rest of the ball.

Ques. 83. What is its structure ?

Ans. It is divisible into several lamellæ, between which a transparent fluid is noticed.

Tunica Choroides.

Ques. 84. What is the choroid coat ?

Ans. It is the most vascular coat of the eye.

Ques. 85. What is its situation ?

Ans. It is placed immediately within the sclerotic coat.

Ques. 86. Where does it commence ?

Ans. At the entrance of the optic nerve ?

Ques. 87. Where does it terminate ?

Ans. Near the edge of the cornea, forming a whitish circle of some firmness, called the ciliary circle, and by which it adheres to the sclerotica.

Ques. 88. What is remarkable at its anterior edge ?

Ans. It appears thrown into numerous regular folds, called ciliary processes.

Ques. 89. What is the pigmentum nigrum ?

Ans. It is a black or dark brown secretion, which covers the internal surface of the choroid coat.

Ques. 90. What are the blood vessels of this coat of the eye ?

Ans. The ciliary arteries, after piercing the sclerotica, ramify copiously in this membrane ; its veins, taking a contorted course, are called vasa vorticosa.

Iris.

Ques. 91. What is the iris ?

Ans. It is a circular membrane, with an opening through its centre, forming an imperfect septum across the cavity of the eye.

Ques. 92. What is its situation ?

Ans. It is attached to the ciliary circle in its whole circumference.

Ques. 93. What is the hole in its middle called ?

Ans. The pupil, which is lessened or augmented by the movements of the iris.

Ques. 94. What name has been given to the posterior side of the iris ?

Ans. It has been called uvea ; this part is covered by the pigmentum nigrum.

Ques. 95. What is the structure of the iris ?

Ans. It consists of a radiated and circular layer of muscular fibres; its arteries, from the ciliary, form by anastomosis two circles,—one near the circumference, called *zona major*, the other near the pupil, called *zona minor*; its veins pass to the *vasa vorticosa* of the choroid.

Retina.

Ques. 96. What is the situation of the retina.

Ans. It is placed internal to the choroid coat.

Ques. 97. How does it arise?

Ans. From the termination of the optic nerve, of which it is an expansion.

Ques. 98. Where does the retina terminate anteriorly?

Ans. It extends anteriorly nearly to the ciliary circle, terminating upon the edge of the chrySTALLINE capsule.

Ques. 99. At what part does the optic nerve terminate?

Ans. A little to the inner side of the centre of the retina.

Ques. 100. What occupies the centre of the retina posteriorly?

Ans. The foramen of Sæmmering, and the yellow zone surrounding it, are parts observable posteriorly, directly at the centre of the retina.

Ques. 101. What is the structure of the retina?

Ans. It is composed of a pulpy substance, of a bluish milky hue.

Ques. 102. How is the retina supplied with blood?

Ans. By a small artery, which occupies the centre of the optic nerve.

Humours of the Eye.

Ques. 103. Of how many humours does the eye consist, and what are their names?

Ans. Three transparent fluids of different densities form the humours of the eye; they are called the aqueous, the chrySTALLINE, and the vitreous humours.

Aqueous Humour.

Ques. 104. What is the aqueous humour ?

Ans. It is a perfectly transparent limpid fluid, situated behind the cornea and before the chrystalline.

Ques. 105. How are the chambers of the eye formed ?

Ans. The space which it occupies is divided by the iris into two cavities, called chambers, and which communicate through the pupil.

Ques. 106. Which is the largest ?

Ans. The anterior chamber is the largest of the two.

Ques. 107. What is the use of the aqueous humour ?

Ans. This humour, while it transmits the rays of light, permits the free motions of the iris ?

Vitreous Humour.

Ques. 108. What is the vitreous humour ?

Ans. It is the most bulky humour of the eye ; it appears of a jelly-like consistence, yet quite transparent.

Ques. 109. What is its situation ?

Ans. It occupies all the ball of the eye behind the chrystalline lens, which lies imbedded in its fore part.

Ques. 110. What is its form ?

Ans. It is spherical, except anteriorly, where it receives the chrystalline lens.

Ques. 111. By what is it enveloped ?

Ans. It is surrounded by its peculiar capsule, called tunica vitrea, or hyoloidea, of the most delicate and transparent texture.

Ques. 112. What is its internal structure ?

Ans. It is divided, by numerous septa proceeding from the inner surface of its capsule, into numerous cells, which contain a fluid much resembling the aqueous humour.

Chrystalline Lens.

Ques. 113. What is the chrystalline lens ?

Ans. It is of solid texture, situated in a concavity at the anterior part of the vitreous, behind the aqueous humour, opposite to the pupil.

Ques. 114. What is its form ?

Ans. It resembles a lens or magnifying glass: its posterior surface is more convex and larger than the anterior.

Ques. 115. By what is it enveloped ?

Ans. It has a proper capsule, which adheres firmly to the capsule of the vitreous humour.

Ques. 116. What is its internal structure ?

Ans. It consists of concentric lamellæ, and these of radii; it is of the consistence of softened gum, but is found much firmer towards the centre than externally.

Vessels and Nerves of the Eye.

Ques. 117. From whence are the arteries of the eye derived ?

Ans. Chiefly from the ophthalmic, a branch of the internal carotid.

Ques. 118. Whence are the nerves derived ?

Ans. The eye and its appendages are copiously supplied with nerves, for besides the optic, which forms the retina, the third and fourth pairs, the ophthalmic or first branch of the fifth pair, the sixth pair, and twigs from the seventh pair, go to the surrounding parts and form the ciliary plexus, whose branches pierce the sclerotica, and pass to the iris.

Use of the Parts of the Eye.

Ques. 119. What is the use of the cornea ?

Ans. It collects and bends inwards the rays of light reflected towards it from surrounding objects.

Ques. 120. What is the use of the aqueous humour ?

Ans. It allows the rays of light a ready passage, and admits freely of the motions of the iris.

Ques. 121. What is the use of the chrySTALLINE lens ?

Ans. It still further concentrates the rays of light so as to make a distinct image at the bottom of the eye.

Ques. 122. What is the use of the vitreous humour ?

Ans. It fills the membranes, and supports the form of the eye, which is essential to the due performance of its office, and maintains the lens at its focal distance from the retina.

Ques. 123. What is the use of the retina ?

Ans. It perceives the picture formed upon its surface by the due collection, refraction, and transmission of the rays of light.

Ques. 124. What is the use of the choroid coat ?

Ans. It is the vascular coat of the eye, allowing the ramification of vessels, and secreting the pigmentum nigrum.

Ques. 125. What is the use of the pigmentum nigrum ?

Ans. It prevents the reflection of the rays of light when once they have reached the retina, and thus confusion is avoided.

Ques. 126. What is the use of the iris ?

Ans. By contracting, it excludes all the superfluous rays reflected from a luminous body, or by expanding, admits through the pupil all that pass through the cornea, in case any object should be sparingly lighted.

Ques. 127. What is the use of the sclerotica ?

Ans. It bounds the form of the eye, and by its strength protects and supports the parts which it contains.

SECTION XXXI.

OF THE ORGAN OF SMELL.

Ques. 1. What is the organ of smell?

Ans. It is much more extensive than would be conjectured from the external prominent part called the nose. It is a double cavity divided by a perpendicular partition.

Ques. 2. Where is it situated?

Ans. Between and below the orbits, above the mouth and below the forehead.

Ques. 3. What is the division of the organ of smell?

Ans. It is divided into its external prominent part, properly called the nose, and its internal cavity.

Ques. 4. What are the external parts of the nose?

Ans. It consists of the root of the nose, the arch of the nose, the tip of the nose, the alæ, and the nostrils or anterior openings of the cavity of the nose.

Ques. 5. What are the internal parts of the nose?

Ans. Its internal part or cavity contains the septum narium, the turbinated bones, the posterior openings of the nares, the frontal, maxillary, and sphænoidal sinuses, the palatine duct, and ductus ad nasum.

Ques. 6. By what bones is the nose formed?

Ans. The os frontis, os æthmoides, os sphænoides, ossa maxillaria, ossa nasi, ossa lachrymalia, ossa palati vomer, inferior turbinated bones and cartilages.

Ques. 7. What are the soft parts of the nose?

Ans. They are the integuments, muscles, pituitary membrane, vessels, nerves, and hairs of the nares.

Ques. 8. How is the root and arch of the nose formed?

Ans. By the nasal process of the superior maxillare bone, and the ossa nasi.

Ques. 9. Of how many cartilages does the inferior part of the external nose consist?

Ans. Of five.

Ques. 10. What is their situation?

Ans. The middle one is part of the septum nasi; it divides the nostrils; two placed anteriorly form the tip, and two laterally the alæ; and these surround the nostrils.

Ques. 11. What is the form and extent of the cavities of the nose?

Ans. The cavities of the nose extend from the nostrils to the posterior openings of the nares, immediately above the arch of the palate; they extend upward to the cribriform plate of the æthmoid bone, and there communicate, forward, with the frontal sinuses, and backward with the sphœnoidal sinuses; laterally, they are bounded on the inner side by the septum, and on the outer side by the maxillary, lachrymal, æthmoid, and turbinated bones; above the latter they communicate with the maxillary sinuses.

Pituitary Membrane.

Ques. 12. How are the internal nares lined?

Ans. By the pituitary membrane.

Ques. 13. What is its use?

Ans. It serves for the expansion of the olfactory and other nerves, for the transmission of vessels, and the secretion of the fluid which moistens its surface.

Ques. 14. Where is it the thickest?

Ans. Upon the septum narium, the turbinated bones, and the lower part of the nares.

Sinuses.

Ques. 15. What sinuses open into the internal nares ?

Ans. The frontal, sphœnoidal, and maxillary sinuses.

Ques. 16. Where do the frontal sinuses open ?

Ans. Into the anterior superior part of the nares.

Ques. 17. Where do the sphœnoidal sinuses open ?

Ans. Into the superior posterior part of the nares.

Ques. 18. Where do the maxillary sinuses open ?

Ans. Laterally above the inferior turbinated bones.

Ductus Incisivi.

Ques. 19. What are the ductus incisivi ?

Ans. In the human subject they usually exist only in the bones, and are filled by soft parts.

Ques. 20. Where are they situated ?

Ans. Behind the large superior dentes incisivi, between the arch of the palate and the bottom of the nares.

Ques. 21. What is their use ?

Ans. They transmit several twigs of arteries and veins, and sometimes are perforated by ducts, the use of which is at present unknown.

Blood Vessels and Nerves of the Nose.

Ques. 22. Whence is the nose supplied with blood ?

Ans. From the external carotids, the veins go to the external jugular.

Ques. 23. What are the nerves of the nose ?

Ans. The olfactory are the chief nerves of the nose, or the nerves of smelling ; but the nose also receives nerves of common sensation from the fifth pair.

SECTION XXXII.

OF THE ORGAN OF HEARING.

Ques. 1. Where is the organ of hearing situated ?

Ans. The organ of hearing, commonly called the ear, is twofold, there being a distinct and perfect organ situated on each side of the head, the most important parts of which are formed in and contained by the temporal bone.

Ques. 2. How is the organ of hearing divided ?

Ans. Into the external and internal ear.

External Ear.

Ques. 3. How is the external ear composed ?

Ans. It consists of a considerable cartilage, invested by common integuments.

Ques. 4. Into what parts is the external ear divided ?

Ans. It is divided into three parts, viz., the pinna, lobus, and meatus auditorius externus.

Pinna.

Ques. 5. What is the situation of the pinna ?

Ans. It forms the greater part of the outer ear.

Ques. 6. How is it formed ?

Ans. It consists of cartilage, invested by common integuments.

Ques. 7. What are the elevations on the pinna ?

Ans. On its anterior or external side are four eminences ; namely, the helix, anti-helix, tragus, and anti-tragus.

Ques. 8. What is the situation of the helix ?

Ans. It forms the large external margin or hem of the outer ear, and extends across its middle.

Ques. 9. Where is the anti-helix ?

Ans. It is the oblong elevation forming an inner margin, and immediately surrounded by the helix.

Ques. 10. What is the tragus ?

Ans. It is the small anterior protuberance below the anterior end of the helix.

Ques. 11. What is the situation of the anti-tragus ?

Ans. It is the posterior protuberance below the inferior end of the anti-helix, and opposite the tragus.

Ques. 12. What are the depressions of the pinna ?

Ans. There are three depressions on the pinna, namely, the fossa navicularis, the fossa innominata, and the concha.

Ques. 13. Where is the fossa navicularis ?

Ans. It is placed in the bifurcation of the superior extremity of the anti-helix.

Ques. 14. Where is the fossa innominata ?

Ans. It is situated between the anterior and superior extremities of the helix and anti-helix.

Ques. 15. What is the concha ?

Ans. It is the great cavity surrounded by the anti-helix, and divided transversely by the anterior part of the helix, which on this account is called the septum conchæ.

Ques. 16. Where are the fissures in the cartilage of the pinna situated.

Ans. When the integuments are removed there are four fissures noticed in the cartilage which forms the pinna ; viz., one situated upon the anterior part of the helix ; one between the terminations of the helix and anti-helix, and two in the base of the tragus, or perhaps more properly in the commencement of the meatus externus.

Ques. 17. What are the ligaments of the pinna ?

Ans. There are three ligaments which fix it in its place ; namely, a superior, an anterior, and a posterior.

Ques. 18. What are the glands of the pinna ?

Ans. The integuments of the pinna are plentifully supplied with sebaceous glands.*

Lobulus.

Ques. 19. What is the situation of the lobe of the ear?

Ans. It forms the inferior extremity of the external ear.

Ques. 20. What is its structure?

Ans. It consists of skin and cellular substance.

Meatus Auditorius Externus.

Ques. 21. What is the situation of the meatus auditorius externus?

Ans. It extends from the bottom of the concha inward to the membrana tympani.

Ques. 22. What is its direction?

Ans. Inward, forward, and upward; and is in its course a little curved downward.

Ques. 23. What is its general length?

Ans. It is about an inch long.

Ques. 24. Which of its portions is the largest?

Ans. It is wider at its extremities than in the middle.

Ques. 25. What is the form of the bore of the meatus externus?

Ans. It is not quite circular but a little oval.

Ques. 26. How is the meatus externus formed?

Ans. It consists in part of cartilage continued from the pinna, and in part of bone.

Ques. 27. Which of its portions is the longest?

Ans. In the adult the bony portion is the longest; but in the fœtus the meatus auditorius is wholly cartilaginous.

* The Muscles of the Ear have already been noticed under the general head of Muscles.

Ques. 28. Where are the fissures in the cartilaginous portion ?

Ans. It has two fissures ; one of which is situated immediately under the tragus, the other at a little distance from it.

Ques. 29. What glands are situated in the cellular membrane and integuments lining the meatus externus ?

Ans. It is lined by a continuation of the integuments of the concha, under which the ceruminous glands are placed, especially towards the concha.

Ques. 30. What is the use of these glands.

Ans. They secrete the cerumen or ear wax, which is discharged through small excretory ducts into the meatus auditorius.

Arteries, Veins, and Nerves of the External Ear.

Ques. 31. From whence are the arteries of the external ear derived ?

Ans. It receives its arteries anteriorly from the temporal, and posteriorly from the occipital arteries.

Ques. 32. Whence do its veins pass ?

Ans. To the external jugular.

Ques. 33. Whence are its nerves derived ?

Ans. From the portio dura and second vertebral pair.

Internal Ear.

Ques. 34. Into what parts is the internal ear divided ?

Ans. It is divided into three parts ; namely, the tympanum, labyrinth, and meatus internus.

Membrana Tympani.

Ques. 35. Where is the membrana tympani ?

Ans. It is situated at the bottom of the meatus externus,

forming the external side of the tympanum ; it is fixed in a bony groove.

Ques. 36. What is its direction and form ?

Ans. It is of an oval form, placed obliquely ; its upper part being turned outward, and its lower part inward. It is slightly concave externally.

Ques. 37. How is it composed ?

Ans. It is composed of two laminae, of which the internal one is a production of the periosteum of the tympanum, and the external one of the cuticle lining the meatus externus ; which by maceration may be removed like the finger of a glove.

Ques. 38. What bone is attached to the inside of the membrana tympani ?

Ans. The malleus, a very small bone contained in the tympanum ; across its upper part runs a small nerve, called chorda tympani.

Tympanum.

Ques. 39. Where is the cavity of the tympanum situated ?

Ans. Immediately within the membrana tympani in the substance of the temporal bone.

Ques. 40. What is its form ?

Ans. It is irregular, resembling a portion of a cylinder ; its outer side is formed by the membrana tympani ; its inner side is bony, and divides this cavity from the labyrinth ; its circumference is irregular.

Ques. 41. What openings are there at the circumference of the tympanum ?

Ans. There are two ; one anteriorly from the eustachian, and another posteriorly to the mastoid cells.

Ques. 42. By what is the cavity of the tympanum lined ?

Ans. By a vascular periosteum.

Ques. 43. What are the contents of the cavity of the tympanum?

Ans. It contains air, and the ossicula auditus, with their muscles and ligaments.

Eustachian Tube.

Ques. 44. Where is the eustachian tube situated?

Ans. It extends from the cavity of the tympanum to the root of the pterygoid process of the sphænoid bone; here it opens into the upper part of the fauces, just behind the posterior nares.

Ques. 45. Of what parts is it composed?

Ans. It consists of a bony, a cartilaginous, and a membranous portion.

Ques. 46. What is the situation of the bony part of the eustachian tube?

Ans. The extremity towards the tympanum is wholly of bone; of the rest, bone forms only the upper part.

Ques. 47. What is the situation of the cartilaginous and membranous parts of the eustachian tube.

Ans. Cartilage forms the internal, and membrane the external parts of its lower side.

Ques. 48. Where is this tube the narrowest?

Ans. Its bony part is the narrowest; it expands in the form of a trumpet towards the mouth.

Ques. 49. What is the direction of the eustachian tube?

Ans. These tubes, one for each ear, are directed from the tympanum obliquely inwards, downwards, and forwards; so that their anterior extremities, in the fauces, are the nearest to each other.

Ques. 50. By what are they lined?

Ans. By a membrane resembling that of the nares.

Mastoid Cells.

Ques. 51. Into what part of the tympanum do the mastoid cells open ?

Ans. Into the posterior and upper part, by a considerable aperture.

Ques. 52. What is their structure ?

Ans. In the adult they are wholly cellular.

Ques. 53. By what are they lined, and what do they contain ?

Ans. They are lined by a vascular periosteum, and contain air.

Bones of the Ear.

Ques. 54. Enumerate the bones of the ear.

Ans. They are four in number, namely, the malleus, the incus, the os orbiculare, and the stapes.

Ques. 55. What is their situation ?

Ans. They form a kind of chain from the membrana tympani to the labyrinth.

Ques. 56. In what order are the bones of the ear connected ?

Ans. The most external is the malleus, situated next to the membrana tympani ; next to this is the incus ; then the os orbiculare ; and lastly, the most internal is the stapes.

Malleus.

Ques. 57. What is the situation of the malleus ?

Ans. It is placed upon the inner side of the membrana tympani, to which it is fixed by its handle.

Ques. 58. What is its form ?

Ans. It consists of a handle, attached to the membrana tympani, having its extremity turned downward ; a short

process at the top of the handle, also turned towards the membrana tympani ; a long process called processus gracilis, which is turned forward, over the inner edge of the ring of this membrane ; a neck which projects inward from the handle, forming an angle with it, and surmounted by a round head, by which it is connected to the incus.

Ques. 59. What muscles are attached to the malleus ?

Ans. It has three muscles ; namely, the tensor tympani, fixed to the posterior and upper part of its handle ; the laxator tympani major, attached to its long process ; and the laxator tympani minor, fixed near its short one.

Incus.

Ques. 60. What is the situation of the incus ?

Ans. It is situated between the malleus and os orbiculare, extending backward toward the mastoid cells.

Ques. 61. What is its form ?

Ans. It consists of a body, a short and a long leg : its body is articulated with the head of the malleus ; its short leg rests on the opening of the mastoid cells, and its long leg bends inward and downward to the orbiculare.

Os Orbiculare.

Ques. 62. What is the size of the os orbiculare ?

Ans. It is the smallest bone in the body, being not larger than a small pin's head.

Ques. 63. What is its situation ?

Ans. It is placed between the point of the long leg of the incus and the head of the stapes.

Ques. 64. What is its form ?

Ans. It is of a flattish circular form.

Stapes.

Ques. 65. What is the situation of the stapes ?

Ans. It is placed immediately behind the os orbiculare, and extends to the fenestra ovalis, on the inner side of the tympanum.

Ques. 66. What is the form of the stapes ?

Ans. It precisely resembles a stirrup, having a small head, which is fixed to the os orbiculare ; two legs, forming the arch, of which the posterior is longest, and which are grooved internally ; and a flat base, whose edge is curved superiorly, straight inferiorly, and fixed in the fenestra ovalis.

Ques. 67. What occupies the space between the legs of the stapes ?

Ans. A fine membrane, which is fixed in the groove on their inner sides.

Ques. 68. What is fixed to its head ?

Ans. The stapedius muscle.

Inner Side of the Tympanum.

Ques. 69. What is the situation of the fenestra ovalis ?

Ans. Toward the upper part of the inner side of the tympanum is an oval hole, placed horizontally, called fenestra ovalis.

Ques. 70. What is fixed in it ?

Ans. The basis of the stapes ?

Ques. 71. What is the situation of the fenestra rotunda ?

Ans. It is very small, placed toward the lower part, and covered by a membrane ; it is nearly circular.

Ques. 72. Where is the promontary of the tympanum situated ?

Ans. Immediately over the fenestra rotunda.

Ques. 73. Where is the hollow bony pyramid of the stapedius situated ?

Ans. Immediately behind the fenestra ovalis, near the circumference of the tympanum ; it is a small projection, with an opening at its apex ; it contains the stapedius.

Ques. 74. What direction does the fallopian aqueduct assume on the inner side of the cavity of the tympanum ?

Ans. It is marked by a rising, which passes first above the fenestra ovalis, then behind it and the fenestra rotunda.

Ques. 75. Where is the elevation of the external semicircular canal situated ?

Ans. On the inner side of the opening of the mastoid cells ; it corresponds with a part of the labyrinth.

Labyrinth.

Ques. 76. What is the situation of the labyrinth ?

Ans. It is situated within the substance of the petrous portion of the temporal bone.

Ques. 77. Of what parts does it consist ?

Ans. It consists of several contorted cavities, which communicate with each other, and are divided into three, viz. the vestibulum, semicircular canals, and cochlea.

Ques. 78. What are the contents of the labyrinth ?

Ans. These cavities contain thin periosteum, a pulpy membrane, formed by the ramifications of the portio mollis of the seventh pair of nerves, blood vessels, and a limpid fluid.

Vestibulum.

Ques. 79. What is the situation of the vestibulum ?

Ans. It occupies the middle of the labyrinth ; the cochlea being placed before, and the semicircular canals behind it.

Ques. 80. What is its form ?

Ans. It is of an oval figure, but irregular, having an hemispherical depression, a semi-oval depression above, and a groove-like sulciform depression behind, leading to the aqueductus vestibuli.

Ques. 81. What opening is there in the external side of the vestibulum?

Ans. The fenestra ovalis opens into its external side.

Ques. 82. What are the openings on the posterior side?

Ans. There are six openings on its posterior side; five great openings belonging to the semicircular canals, and one very small of the aqueduct of the vestibulum.

Ques. 83. What opening is at the anterior side?

Ans. It is the opening which leads to the external or vestibular scala of the cochlea.

Ques. 84. What is the direction of the aqueduct of the vestibulum?

Ans. It passes in a curved direction backward and inward.

Ques. 85. Where is the external opening of the aqueduct of the vestibulum?

Ans. It opens externally about half an inch behind the meatus internus, upon the posterior side of the os petrosum.

Semicircular Canals.

Ques. 86. Where are the semicircular canals situated?

Ans. Behind the vestibulum.

Ques. 87. What is their number?

Ans. They are three in number.

Ques. 88. What are their names?

Ans. They are called the superior, posterior, and external, or horizontal.

Ques. 89. Where do they terminate?

Ans. They terminate in the vestibule by five open-

ings; one end of the superior and another of the posterior canal meet and form a common opening?

Ques. 90. What are the ampullæ of the semicircular canals?

Ans. Each canal has one of its extremities of an elliptical form, and more expanded than the other, called its ampullæ.

Ques. 91. Where are the ampullæ of the superior and posterior canals situated?

Ans. They are situated at their separate openings.

Ques. 92. Where is the ampullæ of the external canal situated?

Ans. At its superior or external opening.

Cochlea.

Ques. 93. Where is the cochlea situated?

Ans. Immediately before the vestibulum, with its base towards the meatus auditorius internus.

Ques. 94. What is its form?

Ans. It is a double spiral, conical canal, resembling the shell of a snail internally.

Ques. 95. How many turns does the canal of the cochlea make?

Ans. It performs two turns and a half.

Ques. 96. By what is the spiral canal of the cochlea divided?

Ans. It is divided into two by a septum, partly bony and partly membranous; the bony part is called lamina spiralis, the membranous part zona mollis. The zona mollis proceeds from the edge of the lamina spiralis to the opposite side of the canal.

Ques. 97. What are the names of the two parts into which the canal of the cochlea is divided?

Ans. They are called the gyri or scalæ.

Ques. 98. What is the relative situation of the scalæ?

Ans. One is situated externally, opens into the vestibule, and is called *scala vestibuli*; the other is situated internally, terminates at the *fenestra rotunda*, and is called *scala tympani*.

Ques. 99. Where do they communicate with each other?

Ans. At the apex of the cochlea they wind round a conical pillar called *modiolus*.

Ques. 100. What is the *infundibulum*?

Ans. It is a small hollow cone surmounting the apex of the *modiolus*; its basis is turned toward the apex of the cochlea, called *cupola*.

Ques. 101. What is the situation of the *lamina spiralis*?

Ans. One edge of it is fixed to, and winds round the *modiolus*.

Ques. 102. By what does the *lamina spiralis* terminate?

Ans. On its apex is a hook-like point, called *hamulus*. It terminates in the *infundibulum*.

Ques. 103. How do the filaments of the *portio mollis* pass into the *scalæ*?

Ans. By numerous small apertures on each side of the *lamina spiralis* and the *modiolus*.

Ques. 104. Where are the branches of the *portio mollis* chiefly ramified?

Ans. Upon the *lamina spiralis* and *zona mollis*.

Meatus Auditorius Internus.

Ques. 105. Where is the *meatus auditorius internus* situated?

Ans. On the posterior side of the *os petrosum*.

Ques. 106. What is its form?

Ans. It is a short tubular canal of some size, terminated by two *fossulæ*.

Ques. 107. How are these *fossulæ* distinguished?

Ans. One of them is the superior and the other the inferior fossula.

Ques. 108. How are they separated from each other?

Ans. By a spine or bony ridge.

Ques. 109. What does the meatus internus contain?

Ans. The portio mollis and portio dura of the seventh pair of nerves, and a small artery.

Ques. 110. Where does the fallopian aqueduct commence?

Ans. From the upper part of the superior fossula.

Ques. 111. What is its course?

Ans. It passes outward through the upper part of the os petrosum; then bends downward and backward, lying on the inner side of the cavity of the tympanum behind, and above the fenestra ovalis. It terminates in the foramen stylo-mastoideum.

Ques. 112. What passes through the fallopian aqueduct?

Ans. The portio dura or fascial nerve.

Ques. 113. By what nerve is the portio dura joined in the fallopian aqueduct?

Ans. It is joined first by a twig of the Vidian nerve, through a foramen on the upper and fore part of the os petrosum; then by the chorda tympani, from the cavity of the tympanum.

Ques. 114. Where is the portio dura joined by the Vidian nerve?

Ans. Just where it is about to turn downward over the inner side of the tympanum.

Ques. 115. Where is the portio dura joined by the chorda tympani?

Ans. A little before it makes its exit by the foramen stylo-mastoideum.

Ques. 116. What is the course of the chorda tympani?

Ans. It proceeds through the cavity of the tympanum

between the handle of the malleus and the long leg of the incus, and passes through the fissura glasseri.

Ques. 117. How is the portio mollis distributed?

Ans. It enters by numerous small apertures, and is spread out within the labyrinth in the form of a delicate pulpy membrane, giving a lining to it in addition to the periosteum.

Use of the Parts of the Ear.

Ques. 118. What is the use of the pinna?

Ans. It collects the sonorous undulations of the air, and reflects them towards the meatus auditorius externus.

Ques. 119. What is the use of the meatus auditorius externus?

Ans. It concentrates and conveys the sound to the membrana tympani.

Ques. 120. What is the use of the membrana tympani?

Ans. It transmits the vibrations to the chain of bones contained in the cavity of the tympanum.

Ques. 121. What is the use of the muscles of the internal ear?

Ans. The muscles of the malleus and incus regulate the tension of the membrana tympani; relaxing it to moderate sounds, and bracing it to perceive faint ones.

Ques. 122. What is the use of the eustachian tube?

Ans. It admits the free passage of air into and from the cavity of the tympanum; thus preserving a due balance with the external atmosphere, and enabling the membrana tympani to move in obedience to the slightest impressions.

Ques. 123. What is the use of the ossicula auditus or chain of bones?

Ans. By their motions they multiply the vibrations

they receive from the membrana tympani, and transmit them to the fluid contained in the labyrinth.

Ques. 124. What is the use of this fluid?

Ans. It being incompressible, faithfully transmits and conveys the undulations it receives all over the nervous membrane which lines the labyrinth.

Ques. 125. What is the immediate organ of hearing; that which perceives the impressions of sound?

Ans. The portio mollis of the seventh pair of nerves, spread out in the form of a fine membrane within the labyrinth; it perceives the impressions of sound, and transmits them to the sensorium.

SECTION XXXIII.

OF THE MOUTH AND ORGAN OF TASTE.

Ques. 1. What is meant by the mouth?

Ans. It does not, anatomically speaking, mean merely the transverse opening bounded by the lips, but the whole cavity to which this leads, as well as the parts adjacent.

Ques. 2. What bones contribute to the formation of the mouth?

Ans. The superior and inferior maxillary bones, ossa palati, and the teeth, form its bony parts.

Ques. 3. How is the mouth divided?

Ans. It is divided into external and internal parts.

External Parts of the Mouth.

Ques. 4. What are the external parts of the mouth ?

Ans. The two lips and the cheeks.

Ques. 5. Of what do they consist ?

Ans. They consist of muscles, covered externally by the common integuments and fat, and lined internally by a vascular membrane, called epithelium, which covers numerous glands.

Ques. 6. What is the appearance of the edges of the lips ?

Ans. They are turned towards each other, and are highly vascular and sensible, being supplied with numerous villi.

Ques. 7. What are the commissures of the lips ?

Ans. They are formed by the union of the lips.

Ques. 8. What is the fossula of the upper lip ?

Ans. It is a groove extending from the septum narium ; in some subjects it is double.

Ques. 9. What are the fræna of the lips ?

Ans. There is one for the upper, and one for the lower lip ; they are folds of the internal membrane which fix the lips to the jaws opposite the incisor teeth.

Internal Parts of the Mouth.

Ques. 10. What are the internal parts of the mouth ?

Ans. They are the gums, the palate, the tongue, the amygdalæ, and the salival glands and ducts.

Gums.

Ques. 11. What is the situation of the gums ?

Ans. They cover both the sides of the alveolar processes, and surround the necks of all the teeth.

Ques. 12. What is their structure ?

Ans. They are composed of a firm, spongy, elastic, and very vascular substance, firmly adhering, by means of periosteum, to the alveolar processes.

Ques. 13. By what membrane are they invested ?

Ans. By a fine membrane, which is a continuation of that which lines the lips and cheeks.

Palate.

Ques. 14. What is the situation and form of the palate ?

Ans. It is surrounded by the teeth of the upper jaw, and extends to the great opening of the pharynx ; it resembles an arch.

Ques. 15. How is it divided, and which part is most anterior ?

Ans. It is divided into the hard and soft palate ; the hard palate is most anterior, and is composed of the palatine processes of the upper jaw and ossa palati.

Ques. 16. By what membrane is the palate covered ?

Ans. The membrane which covers it resembles that which lines the superior and middle parts of the pharynx ; it is studded with small glands.

Ques. 17. How is the soft part of the palate formed ?

Ans. The soft palate, or velum palati, is formed by a continuation of that membrane which lines the hard palate and the cavity of the nose, and by various muscles lying in this duplicature.

Ques. 18. What is its form ?

Ans. It resembles an arch, placed transversely above the root of the tongue, and forming anteriorly one continued surface with the hard palate.

Ques. 19. To what part is the uvula attached ?

Ans. To its middle part.

Ques. 20. What is its form ?

Ans. It is a conical body.

Ques. 21. What is its structure?

Ans. It is formed by a small muscle enveloped in the glandular membrane which lines these parts.

Ques. 22. What are the arches of the palate?

Ans. They are two folds, which proceed downward and to each side; so that the arch on each side is double.

Ques. 23. In what direction do the two arches on each side proceed from the uvula?

Ans. The anterior arch runs towards the side of the basis of the tongue; and the posterior toward the side of the pharynx.

Ques. 24. What is situated between the anterior and posterior arch of the palate on each side?

Ans. An irregular glandular body, called the tonsil or amygdal gland.

Tongue.

Ques. 25. Into what parts is the tongue divided?

Ans. Into a basis and apex, a superior and inferior side, and two edges.

Ques. 26. Of what is it composed?

Ans. It chiefly consists of soft muscular fibres, intermixed with a medullary or fatty substance.

Ques. 27. By what membrane is the tongue invested?

Ans. Its upper side consists of a thick membrane, studded all over with small eminences, and covered by a continuation of the cuticle; it is likewise continued over the lower side, but here it is smooth, forming only a fold in the middle, called frænum.

Ques. 28. What are the papillæ?

Ans. The small eminences on its superior surface.

Ques. 29. How many kinds of papillæ are observable on the tongue?

Ans. There are three kinds, distinguished by the variety in their figure.

Ques. 30. Where are the papillæ capitatae situated?

Ans. On the basis of the tongue, in small fossulae.

Ques. 31. What is their form?

Ans. They resemble in miniature a mushroom, having a narrow neck, and being depressed in the middle. They secrete a salival or mucilaginous fluid.

Ques. 32. Where are the semilenticulares papillæ situated?

Ans. Chiefly in the middle and anterior parts of the tongue.

Ques. 33. What is their form and size?

Ans. They are slightly convex and cylindrical, and next in size to the capitatae.

Ques. 34. Where are the papillæ velosae?

Ans. They occupy the whole surface of the upper side of the tongue, and even the interstices of the other papillæ.

Ques. 35. What is their form and size?

Ans. They are of a conical form, and the smallest papillæ of the tongue.

Salival Glands.

Ques. 36. Enumerate the salival glands, their situation and use.

Ans. They are three in number; namely, the parotid, the submaxillary, and the sublingual; they are situated on each side of the face, and secrete the saliva or spittle.

Ques. 37. What other glands contribute to augment the juices of the mouth?

Ans. There are numerous glands distributed under the membrane, lining all parts of the mouth, which perform this office. They are named from the parts on which they are situated; namely, the labial on the inside of the

lips, the palatine on the palate, the lingual on the tongue, the buccal on the inside of the cheeks, &c., &c.

Parotid Glands.

Ques. 38. Where is the parotid gland situated?

Ans. It is the largest of the lateral glands; it is situated between the external ear and the ramus and angle of the lower jaw, extending over some part of the masseter.

Ques. 39. From what part of the gland does its duct proceed?

Ans. Its excretory duct, called Steno's duct, arises from several lesser ducts at its anterior and upper part.

Ques. 40. What is its course?

Ans. It passes obliquely over the outside of the masseter muscle.

Ques. 41. Where does this duct open into the mouth?

Ans. It perforates the cheek, and opens into the mouth opposite the interstice, between the second and third molar teeth.

Sub-maxillary Glands.

Ques. 42. Where is the sub-maxillary gland situated?

Ans. On the inside of the angle of the lower jaw, near the internal pterygoid muscle.

Ques. 43. From whence does its excretory duct proceed?

Ans. From that side of the gland which is turned to the hypo-glossus. It is called Wharton's duct.

Ques. 44. What is its course?

Ans. It advances between the genio-glossus and mylo-hyoideus muscles, under the sublingual glands.

Ques. 45. Where does this duct open?

Ans. On one side of the frænum of the tongue.

Sublingual Glands.

Ques. 46. Where are the sublingual glands situated ?

Ans. Under the anterior portion of the tongue, between the genio-glossus and mylo-hyoideus muscles.

Ques. 47. Where do its ducts terminate ?

Ans. It has several small ducts, which open close under the side of the tongue, near the gums, a little farther back than the frænum.

Amygdalæ or Tonsils.

Ques. 48. Where are the amygdalæ situated ?

Ans. In the interstice between the arches of the palate on each side.

Ques. 49. What is the form of the amygdalæ ?

Ans. They somewhat resemble the outside of an almond shell, being uneven and covered with several foramina; they are filled with numerous and large follicles.

Ques. 50. What is their use ?

Ans. They secrete a viscid fluid.

Thyroid Gland.

Ques. 51. Where is the thyroid gland situated ?

Ans. On the anterior and inferior part of the neck: its middle portion lies on the crico-thyroidei, and its lateral portions on the thyro-hyoidei muscles.

Ques. 52. What is its form ?

Ans. It seems to be composed of two oblong portions, united by their inferior extremities, so as to have some resemblance to a crescent.

Ques. 53. What is its use ?

Ans. Its use is not understood ; it is perhaps connected with the glands of the mouth.

SECTION XXXIV.

OF THE SKIN, AND OF THE ORGANS OF TOUCH.

Ques. 1. Of what parts does the integument consist ?

Ans. It consists of three parts, namely, the cuticle, rete mucosum, and cutis ; having in most parts the adipose substance situated under them.

Ques. 2. What is the relative situation of the cuticle, rete mucosum, and cutis ?

Ans. The cuticle is the most external ; immediately under it lies the rete mucosum, covering the cutis, which is the most internal, and by much the most thick.

Cutis.

Ques. 3. What is the structure of the cutis ?

Ans. It consists of a close intermixture of fibres, plentifully supplied with blood vessels and nerves ; it is thickest in the palms of the hands and soles of the feet.

Ques. 4. What are the papillæ of the skin ?

Ans. They are numerous small eminences on its external surface, in which the capillary filaments of the cutaneous nerves terminate in radiated pencils ; they are

most prominent on the palms of the hands and soles of the feet, and on the fingers and toes.

Ques. 5. In what form are they arranged?

Ans. In double rows, which are regularly placed as parallel, crooked, waving, or spiral lines, on the red part of the lips; they resemble fine hairs or villi.

Ques. 6. Where is the sense of touch the most acute?

Ans. The papillæ are the parts in which the sense of touch resides; it is more particularly acute at the ends of the fingers, where the regular concentric rows of the papillæ are remarkable.

Ques. 7. Where are the sebaceous follicles situated?

Ans. They exist in the substance of the skin, and open on its surface.

Ques. 8. Where are they most conspicuous?

Ans. About the nose, cheeks, ears, armpits, groins, and genitals.

Ques. 9. What is their use?

Ans. They secrete an unctuous fluid, which protects the skin from the effects of heat and friction.

Ques. 10. What are the other openings in the cutis?

Ans. They are for the hairs, and others very minute called pores, which are the terminations of the exhalent vessels.

Rete Mucosum.

Ques. 11. What is the rete mucosum?

Ans. It is a delicate substance situated every where between the cuticle and cutis, surrounding the papillæ of the cutis, and lying in the interstices between them.

Ques. 12. What is its colour?

Ans. It is white in the Europeans and Northern Asiatics, but black or brown in the Indians, Africans, and others; so that it is the seat of colour.

Cuticle.

Ques. 13. What is the cuticle?

Ans. It is a delicate transparent membrane, covering the rete mucosum and cutis; it is thickest in the palms of the hands, and soles of the feet; it dips in betwixt every minute fold of the cutis, and into every aperture on its surface.

Ques. 14. What is its structure?

Ans. It does not appear to be organized, nor does it possess any sensibility.

Adipose Substance.

Ques. 15. Where is the adipose substance situated?

Ans. It occupies the cellular membrane in various parts of the body, but a layer of it is uniformly found closely adhering to the cutis, in most parts, and on this account it has been by many considered as part of the common covering.

Ques. 16. What parts of the skin are free from it?

Ans. The skin of the eyelids, penis, and scrotum?

Ques. 17. What is its structure?

Ans. It consists of an oleaginous fluid, contained in distinct cells, which do not appear to have any communication with each other.

Ques. 18. Where is its distinct cellular structure most remarkable?

Ans. Under the skin, where it puts on a granulated appearance?

Ques. 19. What is its use?

Ans. It serves as a reservoir of nourishment, fills interstices, guards against pressure, and lessens the specific gravity of the body.

Nails.

Ques. 20. Of what are the nails a continuation ?

Ans. They are considered as a continuation of the cuticle ; they appear as if implanted under a fold of the cutis, and adhere to a similar doubling of the cuticle.

Ques. 21. What is their structure ?

Ans. They resemble horn in their structure.

Ques. 22. How are the nails formed ?

Ans. They grow from the surface of the true skin, on which they lie, and their fibres shoot forward from their roots.

Hairs.

Ques. 23. Where are the bulbs of the hair situated ?

Ans. The hairs grow from roots, called bulbs, which are situated in the cutis ; they are small pulpy bodies, invested by a membrane.

Ques. 24. How do the hairs pass from the cutis ?

Ans. They proceed betwixt the papillæ, and pierce the cuticle.

Ques. 25. What is the structure of the hair ?

Ans. Each hair appears to be a bundle of minute filaments, covered by a membrane.

SECTION XXXV.

OF THE BRAIN IN GENERAL, AND OF ITS MEMBRANES.

Ques. 1. Where is the brain situated?

Ans. It is all that pulpy mass, which, with the membranes that invest it, fills the cavity of the cranium.

Ques. 2. How is the brain divided?

Ans. Into the cerebrum and cerebellum.

Ques. 3. By what membranes is the brain enveloped?

Ans. It is enveloped by three membranes, namely, the dura mater, tunica arachnoides, and pia mater.

Dura Mater.

Ques. 4. What is the situation of the dura mater.

Ans. The dura mater is the most external, and by far the most dense, of the three membranes; it lines the inside of the cranium, to which it firmly adheres, and separates and supports the various portions of the brain by means of duplicatures or processes; it consists of two laminæ.

Ques. 5. What are the adhesions of the external layer of the dura mater?

Ans. It adheres every where to the internal surface of the cranium, but most firmly at its sutures.

Ques. 6. How does the internal differ from the external layer.

Ans. It forms a smooth, polished, and lubricated surface.

Ques. 7. How are the processes of the dura mater formed?

Ans. They are formed by large duplicatures of the internal lamina.

Ques. 8. What are the chief processes of the dura mater?

Ans. The falx cerebri, the tentorium, the falx cerebelli, and the sphœnoidal folds.

Ques. 9. What are the sinuses of the dura mater?

Ans. The two laminæ firmly adhere to each other, excepting opposite the duplicatures of the internal one, where triangular channels are formed, called the sinuses of the dura mater; these are the venous reservoirs of the brain.

Falx.

Ques. 10. What is the situation of the falx cerebri?

Ans. It forms a partition along the upper and middle part of the cavity of the cranium, extending from the edge of the crista galli, along the sagittal suture, to the middle of the tentorium,

Ques. 11. What is its form?

Ques. Its shape is that of a half crescent; the broadest part or basis of which is turned backwards, and joins the tentorium.

Ques. 12. What portions of the brain does it separate?

Ans. It passes between the hemispheres of the cerebrum, so that it supports either in the various positions of the head.

Tentorium.

Ques. 13. What is the situation of the tentorium?

Ans. It is stretched across the anterior part of the cavity, being fixed to the os occipitis, along the grooves of the lateral sinuses, and to the angles of the ossa petrosa, as far as the posterior clinoid process of the os sphœnoides.

Ques. 14. Where is it the broadest ?

Ans. At its middle, where it is united to the falx cerebri.

Ques. 15. What portions of the brain does it separate ?

Ans. It separates the cerebrum from the cerebellum, and supports the posterior lobes of the former.

Ques. 16. What is remarkable at its anterior part ?

Ans. At its anterior part there is an oval notch, through which pass the parts which unite the cerebrum and cerebellum.

Falx Cerebelli.

Ques. 17. Where is the falx cerebelli situated ?

Ans. It descends from the middle of the tentorium, along the inner spine of the os occipitis to the foramen magnum.

Ques. 18. What portions of the brain does it separate ?

Ans. It is placed between the hemispheres of the cerebellum.

Sphænoidal Folds.

Ques. 19. Ennumerate the sphænoidal folds of the dura mater.

Ans. There are two lateral folds, one on each side of the sella turcica, joining the anterior and posterior clinoid processes ; also two anterior folds at the edges of the sphænoidal fissures.

Ques. 20. What are the uses of these folds ?

Ans. The lateral ones form the fossula for the pituitary gland, and the anterior ones divide the anterior from the middle lobes of the cerebrum.

Elongations of the Dura Mater.

Ques. 21. What are the elongations of the dura mater?

Ans. They are productions of both its laminæ, which pass out of the cranium by various apertures.

Ques. 22. Which are the chief elongations of the dura mater?

Ans. The most important passes through the great foramen, and lines the great canal of the vertebræ; the others pass out along with the cerebral nerves.

Sinuses of the Dura Mater.

Ques. 23. What are the sinuses of the dura mater?

Ans. They have been noticed as triangular canals, or venous reservoirs, placed in the substance of that membrane, and formed by the separation of its two layers.

Ques. 24. What are the names of the chief sinuses or veins of the dura mater?

Ans. The great sinuses are the superior longitudinal, in the convex edge of the falx cerebri, terminating in the two lateral sinuses, which are situated in the convex edge of the tentorium; the torcular Herophili, formed between the basis of the falx cerebri and the middle of the tentorium: the lesser sinuses are, the inferior longitudinal, the occipital, the superior and inferior petrosal, the cavernous, and the circular around the sella turcica.

Arteries and Nerves of the Dura Mater.

Ques. 25. How are the arteries of the dura mater distinguished?

Ans. Into the anterior, middle, and posterior.

Ques. 26. Whence are the anterior arteries of the dura mater derived?

Ans. They come from those of the orbit.

Ques. 27. Whence is the middle artery of the dura mater derived?

Ans. It is a branch of the external carotid.

Ques. 28. Whence are the posterior arteries of this membrane derived?

Ans. From the vertebral arteries.

Ques. 29. From whence does it receive its nerves?

Ans. From the trunk of the fifth pair, at its entry into the cavernous sinus, and from the eighth pair, as it passes out of the cranium.

Pia Mater.

Ques. 30. What is the situation of the pia mater?

Ans. It surrounds and closely invests the whole mass of the brain; it consists of two laminæ.

Ques. 31. What is the external laminæ called?

Ans. The tunica arachnoides; it is a delicate transparent membrane, and is spread uniformly over all the convex surface of the brain.

Ques. 32. How is the internal lamina of the pia mater distributed?

Ans. The internal lamina, to which the name of pia mater is now confined, forms numerous plicæ, duplicatures, and septa, which pass every where between the folds of the cerebrum and cerebellum; it is highly vascular, allowing the vessels of the brain to ramify in it, before they enter that substance.

SECTION XXXVI.

OF THE CEREBRUM.

Ques. 1. In what part of the cranium is the cerebrum situated?

Ans. It occupies the greater or superior division of the cavity, above the tentorium, resting also on the anterior and middle parts of the basis cranii.

Ques. 2. What is its form?

Ans. It is somewhat of an oval form, convex above, and flat below.

Ques. 3. How is it divided?

Ans. It is divided above into two lateral portions, called hemispheres, between which the falx cerebri is placed; and below it is divided into two anterior, two middle, and two posterior lobes, by transverse depressions.

Ques. 4. What is the situation of the anterior lobes?

Ans. They are situated in the anterior fossa of the basis cranii.

Ques. 5. Where are the middle lobes placed?

Ans. In the middle fossæ of the basis cranii.

Ques. 6. What is the situation of the posterior lobes?

Ans. They rest on the tentorium.

Ques. 7. What is the fissure between the anterior and middle lobes called?

Ans. The fissura magna silvii.

Ques. 8. What is the appearance of the external surface of the cerebrum?

Ans. It every where consists of tortuous eminences, resembling the windings of the intestines; these are called its convolutions.

Ques. 9. What are the anfractuosities of the brain ?

Ans. They are the grooves which separate the convolutions, which, though apparently shallow, penetrate deeply into the substance of the brain ; into these pass the duplicatures of the pia mater.

Ques. 10. Of what substances does the cerebrum consist ?

Ans. It consists of two kinds of substance ; an external, called cortical or cineritious, and an internal, called medullary.

Ques. 11. What is the situation of the cortical or cineritious substance.

Ans. It is of a reddish ash colour ; it forms the circumvolutions, and dips down into the anfractuosities.

Ques. 12. What is the colour and situation of the medullary substance ?

Ans. It is of a milk-white hue, and constitutes the internal mass of the brain.

Corpus Callosum.

Ques. 13. What is the situation of the corpus callosum ?

Ans. It is an oblong white body, situated at the bottom of the fissure which divides the two hemispheres ; it is covered by the pia mater.

Ques. 14. What is seen on the surface of the corpus callosum ?

Ans. A groove, which runs along its middle, called the rapha ; it is bounded on each side by a small medullary chord.

Ques. 15. What does the corpus callosum join on each side ?

Ans. Its edges blend with the medullary substance of the two hemispheres.

Ques. 16. What names are given to the medullary substance of both hemispheres, together with the corpus callosum ?

Ans. By cutting off the hemispheres of the cerebrum nearly even with the corpus callosum, there is seen a large oval mass of medullary substance, called the centrum ovale, of which the corpus callosum forms the middle part, and the sides are called the medullary arches.

Lateral Ventricles.

Ques. 17. What are the lateral ventricles ?

Ans. They are two cavities, situated under the corpus callosum, and medullary arches of the cerebrum.

Ques. 18. What is their form ?

Ans. The general course of these cavities would be represented by the letter X, or two C's turned back to back ; they are broad and round at their anterior and superior extremities ; they then extend backwards, gradually separating from each other, and contracting ; they then bend downward, after having sent backward a triangular pointed cavity, which slightly turns inward, called *cavitas digitalis*, or posterior horn ; they lastly turn forward, and terminate under their superior extremities, only more backward and outward.

Ques. 19. What divides the lateral ventricles from each other ?

Ans. At the part where they are nearest each other, which is just under the corpus callosum ; there is a delicate partition interposed between them, called the *septum lucidum*.

Ques. 20. What are the parts noticed in the lateral ventricles ?

Ans. They are the *septum lucidum*, the *fornix*, the *plexus choroides*, the *corpora striata*, the *thalami nervorum opticorum*, and the *pineal gland*.

Septum Lucidum.

Ques. 21. To what bodies is the septum lucidum connected?

Ans. It is united to the corpus callosum directly under the rapha, and to the fornix inferiorly.

Ques. 22. How is the septum lucidum composed?

Ans. It consists of two laminae.

Ques. 23. What is the name of the cavity, situated between the laminae of the septum lucidum?

Ans. The fifth ventricle.

Fornix.

Ques. 24. What is the fornix?

Ans. It is a medullary body, situated immediately under the septum lucidum.

Ques. 25. What is its form?

Ans. It is of a triangular figure, one of its edges being posterior, and two lateral.

Ques. 26. What are its connections?

Ans. It is connected by its superior surface to the septum lucidum, and by its posterior edge to the corpus collosum, of which it is a continuation.

Ques. 27. What are the continuations of its angles called?

Ans. They are called pillars, or crura.

Ques. 28. What names do the posterior pillars assume in the lower part of the lateral ventricles?

Ans. The posterior pillar on each side follows the course of the ventricles backward and downwards, in the form of a thin medullary edge, called corpus fimbriatum.

Ques. 29. How do the anterior pillars terminate?

Ans. The anterior pillar is double; it dips down at the forepart of the ventricle.

Ques. 30. What is the appearance of the inferior surface of the fornix ?

Ans. Its inferior surface rests on the thalami nervorum opticorum, and is covered by transverse prominent medullary lines called *lyra*.

Choroid Plexus.

Ques. 31. What is the choroid plexus ?

Ans. They are two loose membranous bodies, of a red and reticular or plexiform appearance.

Ques. 32. What is their situation in the lateral ventricles ?

Ans. They begin small, under the anterior part of the fornix, where they are united ; as they pass backwards, they increase and extend themselves throughout the whole course of these ventricles.

Ques. 33. How are they composed ?

Ans. They are continuations of the pia mater, highly vascular, and containing several tubercles, like glands, and often little hydatids.

Ques. 34. What parts are exposed by the removal of the fornix and choroid plexus ?

Ans. The eminences of the lateral ventricles, viz., the corpora striata, and the thalami nervorum opticorum.

Corpora Striata.

Ques. 35. What is the situation and form of the corpora striata ?

Ans. They are placed at the bottom of the anterior and outer part of the lateral ventricles ; in shape they are pyriform.

Ques. 36. What parts of the corpora striata are nearest each other ?

Ans. Their anterior large extremities are separated

from each other only by the septum lucidum ; but posteriorly they are at a much greater distance.

Ques. 37. What is the internal structure of the corpora striata ?

Ans. They are composed of alternate striæ of the medullary and cortical substances.

Thalami Nervorum Opticorum.

Ques. 38. What is the situation of the thalami nervorum opticorum ?

Ans. They are situated between the posterior extremities of the corpora striata.

Ques. 39. What is their form ?

Ans. They are convex superiorly, and of an oval shape ; but their internal sides are flat, smooth, and in contact.

Ques. 40. How are the thalami nervorum opticorum connected ?

Ans. They are joined at the middle and anterior part of their internal sides by the commissura mollis, a short chord of soft substance.

Ques. 41. What is the tenia semicircularis ?

Ans. It is a white, prominent line, lodged in the groove formed between the corpus striatum and thalamus, on each side.

Ques. 42. What is the internal structure of the thalami nervorum opticorum.

Ans. Their external surface is white ; but internally they are composed of medullary and cineritious substance.

Pedes Hippocampi.

Ques. 43. What are the pedes hippocampi.

Ans. They are two medullary protuberances of a semicylindrical form.

Ques. 44. Where are they situated ?

Ans. In the posterior contorted part of the lateral ventricles.

Ques. 45. What is the course of the pedes hippocampi?

Ans. They describe a curve, whose convexity is directed outwards, following the course of the ventricles.

Ques. 46. What is remarkable on their inner edges?

Ans. The corpora fimbriata run along their internal concave edges.

Ques. 47. How do they terminate?

Ans. Their terminations at the extremity of the ventricles are rounded, and present two or three little smooth tubercles.

Ques. 48. Of what are they composed?

Ans. They are composed of medullary substance externally, and of cortical substance internally.

Hippocampus Minor.

Ques. 49. What is the hippocampus minor?

Ans. It is an oblong medullary protuberance, situated in the cavitas digitalis, or posterior horn of each ventricle.

Ques. 50. What is its form?

Ans. It is of the same form, and takes the same course, as the cavity.

Ques. 51. With what is it connected?

Ans. It is connected with the posterior pillar of the fornix, from which it seems to proceed.

Pineal Gland.

Ques. 52. Where is the pineal gland situated?

Ans. Behind the thalami nervorum opticorum, and above the tubercular quadrigemina, under the posterior part of the fornix.

Ques. 53. What is its form?

Ans. It is irregularly round, and sometimes of a conical form.

Ques. 54. How is it connected ?

Ans. It is connected to the lower part of the thalami, by two medullary peduncles.

Ques. 55. What is its internal structure ?

Ans. It consists mostly of cortical substance, and generally contains a gritty matter ?

Ques. 56. What is situated below the pineal gland ?

Ans. Its base is connected with the posterior commissure of the cerebrum, which is a transverse medullary chord towards the posterior part of the third ventricle.

Tubercula Quadrigemina.

Ques. 57. Where are the tubercula quadrigemina situated ?

Ans. They are two pairs of medullary eminences, situated behind the thalami nervorum opticorum, and under the pineal gland.

Ques. 58. What is their form ?

Ans. Each is transversely oblong ; the superior, called nates, being a little more rounded and broader than the inferior, called testes.

Ques. 59. What is their structure ?

Ans. Their surface is medullary ; their inner substance cineritious.

Apertures in the Lateral Ventricles.

Ques. 60. What is the foramen of Monro ?

Ans. It is an aperture of communication, between the two lateral ventricles.

Ques. 61. Where is it situated ?

Ans. Just behind the anterior pillars of the fornix, and over the fore part of the third ventricle.

Ques. 62. What is the foramen commune anterius, or vulva ?

Ans. It is an opening of communication with the third ventricle.

Ques. 63. Where is it situated?

Ans. Before the thalami, behind the anterior commissure, and just under the foramen of Monro.

Ques. 64. What is the foramen commune posterius, or anus?

Ans. It is stopped by the choroid plexus; when the parts are in their natural situations, it is situated before the posterior commissure, and behind the thalami.

Third Ventricle.

Ques. 65. Where is the third ventricle situated?

Ans. It is the space between the thalami nervorum opticorum.

Ques. 66. Where does it terminate?

Ans. At its fore part it extends downward, under the anterior commissure, and terminates in the infundibulum.

Ques. 67. What is the infundibulum?

Ans. It is a funnel-like membranous tube, which leads to the pituitary gland?

Ques. 68. What proceeds from its posterior part?

Ans. The iter-a-tertio-ad-quartum-ventriculū.

Ques. 6. Where does the iter-a-tertio-ad-quartum-ventriculū terminate?

Ans. It passes under the tubercula quadrigemina, and terminates in the fourth ventricle.

Pituitary Gland.

Ques. 70. Where is the pituitary gland situated?

Ans. In the sella turcica.

Ques. 71. What is its form?

Ans. It is transversely oval, and is sometimes on its lower part divided into two lobes by a small notch.

Ques. 72. What is its structure ?

Ans. It seems to be of peculiar substance, neither cerebral nor glandular.

SECTION XXXVII.

OF THE CEREBELLUM.

Ques. 1. Where is the cerebellum situated ?

Ans. It is situated in the inferior cavity of the cranium, under the tentorium.

Ques. 2. What is its general form ?

Ans. It is broader laterally than before or behind, and flattened superiorly.

Ques. 3. How is it divided ?

Ans. It is divided into two lobes posteriorly, by the falx cerebelli.

Ques. 4. What is its superficial appearance ?

Ans. It has no convolutions, but on its surface are deep concentric sulci or grooves.

Ques. 5. What is its structure ?

Ans. Like the cerebrum, it consists of two substances, the cortical and medullary.

Ques. 6. What is the appearance called *arbor vitæ* ?

Ans. By cutting the cerebellum vertically from above downward, the arrangement of the two substances may be shown, the medullary appearing within the cortical, like

a tree with numerous branches ; hence it is called arbor vitæ.

Ques. 7. What are the external eminences of the cerebellum denominated ?

Ans. The appendices vermiformes ; they are two worm-like eminences.

Ques. 8. What is their situation ?

Ans. One is situated at the anterior and superior part, the other at the posterior and inferior part of the cerebellum.

Fourth Ventricle.

Ques. 9. Where is the fourth ventricle situated ?

Ans. It runs backward and downward along the middle of the cerebellum.

Ques. 10. What opens into it anteriorly ?

Ans. The iter-a-tertio-ad-quartum-ventriculum.

Ques. 11. Where is the valvula vicusensii situated ?

Ans. At the beginning of the fourth ventricle, immediately behind the iter-a-tertio-ad-quartum-ventriculum.

Ques. 12. What is its posterior termination called ?

Ans. It is called calamus scriptorius.

Ques. 13. From whence do the crura cerebelli proceed ?

Ans. From the inferior and anterior part of the cerebellum.

SECTION XXXVIII.

OF THE MEDULLA OBLONGATA.

Ques. 1. What is the medulla oblongata ?

Ans. It is a large medullary body, situated in the middle of the basis of the cerebrum and cerebellum.

Ques. 2. How is it composed ?

Ans. It is formed by the union of the crura of the cerebrum and cerebellum.

Ques. 3. What are the crura of the cerebrum and cerebellum ?

Ans. They are the continuations of the medullary substance of those parts which unite at the pons varolii.

Ques. 4. How does the medulla oblongata terminate posteriorly ?

Ans. In the medulla spinalis, which passes down the vertebral canal.

Pons Varolii.

Ques. 5. What is the situation of the pons varolii ?

Ans. It is placed across the union of the crura cerebri and cerebelli.

Ques. 6. What is its form ?

Ans. It is a transverse semiannular protuberance.

Ques. 7. What is its superficial appearance ?

Ans. Its surface is streaked transversely, and divided into lateral parts by a longitudinal depression.

Corpora Olivaria and Corpora Pyramidalia.

Ques. 8. What other eminences are there on the medulla oblongata ?

Ans. From the pons varolii the medulla oblongata descends, becomes conical, and has four longitudinal eminences on its inferior surface, called the corpora pyramidalia, and corpora olivaria.

Ques. 9. What is the situation of the corpora pyramidalia ?

Ans. They are placed in the middle, in a longitudinal direction, behind the pons varolii.

Ques. 10. What is the situation of the corpora olivaria ?

Ans. They are situated on the outside of the corpora pyramidalia.

Corpora Mammillaria.

Ques. 11. What are the corpora mammillaria ?

Ans. They are two small round medullary bodies, situated very near the infundibulum.

Ques. 12. What relation do they bear to the anterior pillar of the fornix ?

Ans. They are placed immediately under the basis of the anterior pillars of the fornix.

SECTION XXXIX.

OF THE MEDULLA SPINALIS.

Ques. 1. Whence may the medulla spinalis be said to arise ?

Ans. It proceeds from the extremity of the medulla oblongata.

Ques. 2. What is its situation ?

Ans. It is lodged in the canal of the vertebræ.

Ques. 3. By what membranes is it invested ?

Ans. By a continuation of the membranes of the brain.

Ques. 4. What is its form ?

Ans. It is somewhat flattened anteriorly and posteriorly, and a groove runs along these surfaces.

Ques. 5. What is its internal structure ?

Ans. Like the cerebrum and cerebellum, it consists of a cortical and medullary substance.

Ques. 6. Where does it terminate ?

Ans. It terminates pointed, at the os sacrum ; towards its end it consists of bundles of nervous filaments, which has occasioned it to be called cauda æquina.

ANGIOLOGY.

SECTION XL.

OF THE ARTERIES IN GENERAL.

Ques. 1. What are the arteries ?

Ans. They are those blood vessels which convey the blood from the heart to all parts of the body.

Ques. 2. How are they distinguished from the veins ?

Ans. They differ in being whiter, more dense, firmer and more elastic, when cut across presenting a gaping aperture, and in the living subject by their pulsatory motion.

Ques. 3. How do they begin at the heart ?

Ans. They commence by two trunks of nearly equal size, viz., the pulmonary artery from the right ventricle, distributed to the lungs only ; and the aorta from the left ventricle, whose branches pervade every part of the body.

Ques. 4. What angles do the branches form with these trunks ?

Ans. They almost always form very obtuse angles with the trunks above ; but less so in proportion to their nearness to the heart.

Ques. 5. How do the arteries terminate ?

Ans. They terminate in five different ways ; first, in veins, by mere continuity of canal ; second, as exhalents on the skin, and in the various internal cavities ; third, in glands, secreting the various fluids ; fourth, in cellular

bodies, as in the penis and spleen ; fifth, by anastomosis, or branches of mutual communication between the arteries.

Ques. 6. What is the structure of the arteries ?

Ans. They are composed of three coats, viz. a cellular or external coat, an elastic or nervous coat, a muscular coat, and a cuticular or internal coat ; they are nourished by vessels called vassa vassorum.

Of the Pulmonary Artery.

Ques. 7. From what part of the heart does the pulmonary artery arise ?

Ans. From the right ventricle.

Ques. 8. What is its course ?

Ans. It ascends towards the left, passing before the beginning of the aorta.

Ques. 9. How is it divided ?

Ans. It divides into two, viz. the right and left pulmonary arteries, one for each lung.

Ques. 10. How are they distributed ?

Ans. They ramify throughout the lungs.

Ques. 11. How does the right pulmonary artery differ from the left in its course ?

Ans. It passes behind the aorta and superior cava ; it is also the longest.

Ques. 12. How do they terminate in the lungs ?

Ans. By minute ramifications, which form upon the surfaces of the air cells, the rete mirabile Malpighii.

Of the Aorta.

Ques. 13. From what part of the heart does the aorta arise ?

Ans. From the superior part of the left ventricle, opposite the fourth dorsal vertebra.

Ques. 14. What is its general course ?

Ans. It ascends obliquely towards the right; it then forms a curve backwards and to the left, ascending as high as the second dorsal vertebra; whence it passes downwards and backwards to the left side of the body of the third dorsal vertebra, and continues its course along the bodies of the vertebræ as far as the os sacrum, lying a little to the left.

Ques. 15. How is it generally divided?

Ans. It is usually divided into the ascending and descending aorta; and the descending is further divided into the superior and inferior, or thoracic and abdominal portions.

Ques. 16. What parts of the body are supplied with blood from each of its divisions?

Ans. The head and upper extremities are supplied from the ascending aorta; the trunk and lower extremities from the descending.

Ques. 17. What are the capital branches of the aorta?

Ans. They are the two subclavians, the carotids, the cœliac, the superior mesenteric, the emulgent, the inferior mesenteric, and the iliac arteries.

Ques. 18. What are the smaller branches?

Ans. They are the coronary, bronchial, œsophageal, intercostal, inferior diaphragmatic, spermatic, lumbar, and sacral arteries.

Ques. 19. Which of the branches of the aorta arise in pairs, and which of them singly?

Ans. They all arise in pairs except the cœliac, the two mesenteric, some of the œsophageal, the bronchial, and sometimes the sacral.

Ques. 20. What are the first arteries given off by the aorta?

Ans. The coronary.

Ques. 21. What are the names of the arteries given off from the arch of the aorta?

Ans. There are three, viz., the arteria innomanata, of

common trunk of the right carotid and right subclavian, the left carotid, and left subclavian.

Ques. 22. What is the general course of the carotid arteries ?

Ans. They run directly to the head.

Ques. 23. How are they divided ?

Ans. Into the external and internal carotid.

Ques. 24. How is the external carotid distributed ?

Ans. To the face and external parts of the head.

Ques. 25. How are the internal carotids distributed ?

Ans. To the brain.

Ques. 26. Whither do the subclavian arteries pass ?

Ans. They pass behind and under the clavicles to the upper extremity.

Ques. 27. Where do they terminate ?

Ans. At the upper edge of the first rib.

Ques. 28. What name do they assume in passing from the thorax ?

Ans. They take the name of axillary arteries.

Ques. 29. What arteries are given off from the thoracic portion of the descending aorta ?

Ans. The bronchial, œsophageal, and intercostal arteries.

Ques. 30. What arteries does the abdominal portion of the descending aorta give off ?

Ans. The phrenic, celiac, superior mesenteric, emulgent, spermatic, inferior mesenteric, lumbar, sacral, and iliac arteries.

Ques. 31. Whither do the phrenic arteries pass ?

Ans. They go to the diaphragm.

Ques. 32. Where do the celiac arteries go ?

Ans. To the stomach, spleen, and liver.

Ques. 33. What parts does the superior mesenteric supply ?

Ans. The mesentery, small intestines, &c.

Ques. 34. Where do the emulgent arteries go ?

Ans. To the kidneys.

Ques. 35. Where do the remainder of the branches go?

Ans. The spermatic to the testes, the inferior mesenteric to the great intestines, the lumbar to the loins, and the sacral to the sacrum.

Ques. 36. How does the aorta terminate?

Ans. It terminates in the two iliac arteries, which pass to the pelvis and lower extremities.

Ques. 37. How are the iliac arteries divided?

Ans. They divide into the external and internal iliac arteries; the internal iliacs go to the pelvis, the external pass to the thighs and lower extremities.

Ques. 38. Where do they terminate?

Ans. Under Poupart's ligament.

Ques. 39. What name does the external iliac assume on passing from the abdomen?

Ans. The continuations of the external iliacs on the lower extremities, are called the femoral arteries.

SECTION XLI.

OF THE ARTERIES OF THE HEART.

Ques. 1. What is the number of the coronary arteries?

Ans. There are two: a right and left coronary artery.

Ques. 2. Where do they arise?

Ans. Immediately above the semilunar valves.

Ques. 3. What is the course of the right coronary artery?

Ans. It passes in the groove between the right auricle and ventricle, round the right edge of the heart to its in-

ferior flat surface, along the middle of which it runs to the apex.

Ques. 4. What is the course of the left coronary artery?

Ans. It is smaller than the right; it passes between the pulmonary artery and left auricle, and then divides into two or three branches; one runs along the middle of the upper surface; another passes round the basis of the flat side; and a third often goes to the septum ventriculorum.

SECTION XLII.

OF THE ARTERIES OF THE HEAD.

Ques. 1. What arteries supply the head?

Ans. The two carotids.

Ques. 2. Where do they arise?

Ans. The right arises from the arteria innominata, and the left is the next capital branch given off by the aorta.

Ques. 3. What is their course?

Ans. They ascend on each side of the trachea, between it and the internal jugular vein, as high as the larynx, without giving off any branches; and in this course are called the primitive carotids.

Ques. 4. How are they divided?

Ans. Opposite to the os hyoides they divide into the external and internal carotids.

Ques. 5. What is the relative situation of the external and internal carotid arteries?

Ans. The external is situated before and to the inside of the internal, at their origin.

External Carotid Artery.

Ques. 6. What is the general course of the external carotid artery ?

Ans. It ascends behind the angle of the lower jaw, passes under the parotid gland, and terminates opposite the condyle of the lower jaw.

Ques. 7. How many branches does it give off, and what are their names ?

Ans. It gives off nine branches, viz.; anteriorly, the superior thyroideal, the lingual, the external maxillary or labial, and the facial; posteriorly, the occipital, the posterior auris; interiorly, the ascending pharyngeal; and lastly, it divides into the temporal, and the internal maxillary.

Ques. 8. Where does the superior thyroideal artery arise ?

Ans. It arises from the inner side of the external carotid near its origin.

Ques. 9. What is its course and distribution ?

Ans. Immediately after its origin, it bends downwards and gives branches to the jugular glands, the fat, and the skin; then runs transversely, and is distributed to the thyroid gland and larynx, as well as slightly to the pharynx.

Ques. 10. What is the next branch given off ?

Ans. The lingual.

Ques. 11. What is its course and distribution ?

Ans. It passes over the cornu of the os hyoides to the muscles of that bone and of the tongue, and to the sublingual gland; then loses itself in the tongue, where it has been called the raninal artery.

Ques. 12. What is the next branch given off ?

Ans. The external maxillary or labial.

Ques. 13. What is its course and distribution ?

Ans. It arises anteriorly, and passes over and just before the masseter, and middle of the lower jaw ; it then runs under the depressor anguli oris, supplying it, the buccinator, and the quadratus ; it sends off first, the submental, below the chin,—next, a contorted branch, which, dividing at the commissure of the lips, runs along their edges and forms, with its fellow, the coronaria labiorum ; it then ascends towards the nose, and is distributed about it ; it afterwards reaches the inner angle of the palpebræ, and disperses several branches.

Ques. 14. What is the next branch given off ?

Ans. The ascending pharyngeal is the next in order, arising from the inner side of the external carotid ; it is of small size, and ascends upon the rectus anticus to the pharynx ; some of its branches enter the cranium.

Ques. 15. What branch is next given off ?

Ans. The occipital, arising posteriorly.

Ques. 16. What is its course ?

Ans. It passes obliquely before the internal jugular vein, and giving twigs to the stylo-hyoideus, stylo-glossus, and digastric, it runs between the styloid and mastoid processes, supplying the muscles and integuments of the os occipitis ; it communicates posteriorly with the vertebral and cervical, and superiorly with the temporal artery.

Ques. 17. What is the next branch given off ?

Ans. The posterior auris, arising posteriorly ; it is distributed to the external ear.

Ques. 18. What is the next branch given off ?

Ans. The fascial ; it arises anteriorly.

Ques. 19. What is its course ?

Ans. It is small ; passes across before the masseter muscle, and is distributed to it, and to the fat of the cheek.

Ques. 20. What artery is next given off ?

Ans. The temporal.

Ques. 21. What is its course and distribution ?

Ans. It emerges from the parotid gland, ascends over the zygoma, and divides into an anterior, middle, and posterior branch. The anterior or frontal branch supplies the forehead ; the middle or parietal branch partly to the forehead, and partly to the occiput ; and the posterior or occipital branch, to the occiput.

Ques. 22. What is the next and last branch ?

Ans. The internal maxillary ; it commences from the termination of the external carotid.

Ques. 23. What is its course ?

Ans. Just below the cervix of the lower jaw it bends inward, forward, and downward ; and then ascends forward to the sphæno-maxillary fissure.

Ques. 24. What arteries does the internal maxillary give off ?

Ans. It gives off six branches, viz., the arteria meningea media, the inferior maxillary, the alveolar, the infra orbital, the palato-maxillary, and the sphæno-palatine ; and also various other branches to the adjacent parts, from which they have received names.

Ques. 25. Describe the course and distribution of the branches enumerated.

Ans. The arteria meningea media passes through the foramen spinosum of the os sphænoides to the dura mater ; the inferior maxillary enters the canal of the lower jaw, and goes to the teeth and chin ; the alveolar goes to the back teeth of the upper jaw ; the infra orbital passes along the infra orbital canal to the cheek ; the palato-maxillary descends in the canal of the same name to the palate ; and the sphæno-palatine goes to the cavity of the nose.

Internal Carotid Artery.

Ques. 26. What is the general course of the internal carotid artery ?

Ans. At first it forms a curve backward, and is situated more posteriorly than the external ; it ascends to the petrous portion of the temporal bone, passes through its canal into the cavernous sinus ; it there forms another considerable curve by the side of the sella turcica, and by the side of the internal clynoïd process it pierces the dura mater.

Ques. 27. Enumerate the branches of the internal carotid.

Ans. It sends one branch forward just as it pierces the dura mater, which accompanies the optic nerve through the foramen opticum, called the ophthalmic, which is distributed to the contents of the orbit ; it then divides into three branches ; namely, the communicans, which runs backwards to join the vertebral ; the anterior cerebri ; and the media cerebri.

Ques. 28. What is the course of the anterior cerebri ?

Ans. It runs forward and unites with its fellow from the other side, and then divides into two or three branches, which go to the anterior lobes of the brain, the corpus callosum, and to the middle lobes of the brain.

Ques. 29. What is the course of the media cerebri ?

Ans. It is larger than the former ; divides into several rami, which supply the superficial parts of the brain above and below.

SECTION XLIII.

ARTERIES OF THE UPPER EXTREMITIES.

Subclavian Arteries.

Ques. 1. What is the number of the subclavian arteries ?

Ans. There are two, one going to each arm.

Ques. 2. Where do they arise ?

Ans. The right subclavian arises from the arteria innominata ; the left is the third branch, which proceeds directly from the arch of the aorta.

Ques. 3. What is their course ?

Ans. They pass transversely under the clavicles, and over the first rib.

Ques. 4. Where do they change their name ?

Ans. Above the middle of the first two ribs, between the anterior insertions of the scaleni ; they then take the name of axillary arteries.

Ques. 5. Which subclavian artery is the shortest ?

Ans. The left ; it also takes a more oblique course than the right.

Ques. 6. Enumerate the branches of the subclavian artery.

Ans. They run some way without giving off any branches ; then each gives off six, viz., the vertebral, the internal mammary, the cervical, the intercostal, the inferior thyroideal, and the supra-scapular arteries.

Ques. 7. Where does the vertebral artery arise ?

Ans. It arises from the posterior and upper side of the subclavian.

Ques. 8. What is its course and distribution ?

Ans. It ascends and enters the canal formed in the transverse cervical processes, sending off twigs in its ascent to the medulla spinalis and its membranes, and giving arteries to the vertebral muscles ; its course is very tortuous, especially before it enters the cranium, at the foramen magnum occipitale ; before entering the cranium, it communicates with the cervical and occipital arteries, and immediately after it enters it gives branches to the medulla oblongata, corpora olivaria, &c. ; it then advances on the basilar process of the os occipitis ; here joining its fellow, it forms the basilar artery, which communicates with the branches of the internal carotid, and is distributed to the posterior lobes of the brain.

Ques. 9. What is the circulus arteriosus, or the circle of Willis ?

Ans. The branches of communication between the vertebral arteries and the internal carotids surround the sella turcica, and form the circulus arteriosus.

Ques. 10. Where does the internal mammary artery arise ?

Ans. It arises from the anterior and lower side of the subclavius.

Ques. 11. What is its course and distribution ?

Ans. It descends behind the cartilages of the true ribs, an inch from the sternum, giving branches to the thymus, mediastinum, pericardium, pleura, intercostal muscles, &c. ; and passes from the thorax by the side of the ensiform appendix of the sternum, to the rectus abdominis, where it communicates with the epigastric artery.

Ques. 12. Where does the cervical artery arise ?

Ans. From the upper side of the subclavian.

Ques. 13. What is its course and distribution ?

Ans. This artery sometimes arises singly and immediately divides, or its two branches have distinct origins; the cervicalis anterior runs behind the carotid of the same side, and is distributed to the anterior muscles of the neck, and to those of the larynx, pharynx, &c.; the posterior cervical passes under the transverse process of the last vertebra of the neck, and runs to the posterior cervical muscles.

Ques. 14. Where does the superior intercostal arise?

Ans. From the lower side of the subclavian.

Ques. 15. What is its course?

Ans. It descends on the inside of the two or three uppermost ribs, near their heads, and sends off under each of these ribs a branch which runs along its lower edge, and supplies the intercostal muscles, contiguous parts of the pleura, &c.

Ques. 16. Where does the inferior thyroideal arise?

Ans. From the upper part of the subclavian, near the internal mammary.

Ques. 17. What is its course and distribution?

Ans. It ascends, passes behind the primitive carotid, and is chiefly distributed to the thyroid gland.

Ques. 18. Where does the supra-scapular artery arise?

Ans. It arises near the inferior thyroideal, and sometimes from it; it is often a considerable branch.

Ques. 19. What is its course and distribution?

Ans. It passes to the notch behind the coracoid process of the scapula, and is distributed to the muscles at the back and upper part of that bone.

Axillary Arteries.

Ques. 20. Where do the axillary arteries commence?

Ans. They begin at the first rib, between the insertions of the scaleni, being the continuations of the subclavian.

Ques. 21. Where do they terminate ?

Ans. Opposite the lower part of the tendon of the latissimus dorsi, being about four inches long ; its continuation is called the brachial artery.

Ques. 22. Enumerate the branches of the axillary arteries.

Ans. Each axillary artery sends off five or six branches, namely, the external mammary or thoracic arteries, the infra scapular, the anterior circumflex, and the posterior circumflex.

Ques. 23. How many external mammary arteries are there ?

Ans. There are usually three or four, but two of which are chiefly noticed.

Ques. 24. Which is the first branch given off by the axillary artery ?

Ans. The superior mammary.

Ques. 25. What is its course ?

Ans. It descends between the pectoralis major and minor, giving branches to them and to the serratus anticus, latissimus dorsi, &c.

Ques. 26. What is the second branch given off ?

Ans. The inferior mammary.

Ques. 27. What is its course ?

Ans. It runs along the inferior edge of the pectoralis major, and is distributed to the adjacent muscles, breast, and skin.

Ques. 28. What is the third branch given off ?

Ans. The infra scapular.

Ques. 29. What is its course and distribution ?

Ans. It is a very considerable artery, and takes the course of the inferior costa of the scapula, sending branches to the subscapularis, teres major and minor, and large branches to the inferior part of the scapula.

Ques. 30. What is the course and distribution of the anterior circumflex artery ?

Ans. It is small ; it runs forwards under the coraco-brachialis, then bends outward, and passes under the deltoid.

Ques. 31. Where does the posterior circumflex artery arise ?

Ans. It is a considerable vessel, arising from the lower and posterior part of the trunk.

Ques. 32. What is its course and distribution ?

Ans. It runs backward between the head of the os humeri and teres major, surrounding the articulation till it reaches the posterior part of the deltoid, under which it passes and is distributed.

Ques. 33. Where does the brachial artery commence ?

Ans. It is the continuation of the axillary artery, beginning immediately below the tendon of the latissimus dorsi.

Ques. 34. What is its course ?

Ans. It descends on the inside of the arm, over the coraco-brachialis, and short head of the triceps, and along the inner edge of the biceps to the middle of the arm.

Ques. 35. What branches are given off by the brachial artery above the bend of the arm ?

Ans. Besides many small branches to the neighbouring parts, it sends off, first, the profunda humeri superior, from the inner side of its upper part—it is a long branch, which passes behind the bone, and communicates with the radial artery ; secondly, the profunda inferior, about the middle of the arm, which descends toward the inner condyle ; thirdly, the anastomoticus magnus, given off a little above the inner condyle, communicating with the arteries of the fore arm.

Ques. 36. What is the situation of the brachial artery at the bend of the arm ?

Ans. At the bend of the arm it runs under the aponeurosis of the biceps, and under the median vein.

Ques. 37. How does the brachial artery terminate ?

Ans. A little below the fold of the arm it divides into two principal branches ; an inner or posterior, named ulnar or cubital, and an outer or anterior, named radial.

Ques. 38. What is the course of the ulnar artery ?

Ans. It passes deep under the flexors of the hand and fingers to the inner part of the fore arm, along the outer side of the flexor carpi ulnaris and os pisiforme to the palm of the hand ; passing over the anterior annular ligament, and under the palmar fascia, and here forming the superficial palmar arch.

Ques. 39. What are the chief branches given off by the ulnar before it reaches the wrist ?

Ans. First, the ulnar recurrent ; second, the anterior interosseous artery ; and third, the posterior interosseous artery.

Ques. 40. What is the course of the ulnar recurrent ?

Ans. It runs to the inner condyle, then turns up to communicate with the branches from the anastomoticus.

Ques. 41. Where is the anterior interosseous given off ?

Ans. It is given off deeply between the heads of the ulna and radius.

Ques. 42. What is its course ?

Ans. It descends close to the interosseous ligament, passes under the pronator quadratus, behind which it perforates the ligament, and goes to the back of the wrist.

Ques. 43. Where is the posterior interosseous given off ?

Ans. It has usually a common origin with the anterior.

Ques. 44. What is its course and distribution ?

Ans. About a couple of inches below the articulation it pierces the interosseous ligament, and having given off a recurrent toward the external condyle of the os humeri, it descends behind the ligament, and is distributed to the muscles on the back of the arm, and communicates with the anterior interosseous and other arteries.

Ques. 45. What is the course of the superficial palmar arch?

Ans. It crosses the upper part of the palm of the hand and passes towards the thumb, lying between the palmar fascia and flexor tendons of the fingers.

Ques. 46. What branches are given off by it?

Ans. It sends off five branches, viz., the ulnaris profunda, and four digital arteries.

Ques. 47. What is the course and distribution of the ulnaris profunda?

Ans. It passes deep under the flexor tendons, to join the arcus profundus of the radial artery; it also sends a branch to the inner side of the little finger.

Ques. 48. What is the course and distribution of the digital arteries?

Ans. They are given off in succession; each passes between the heads of two neighbouring metacarpal bones; it then splits into two, one branch passing along the inside of one finger, the other branch along the outside of the adjacent finger. The first supplies the outside of the little finger, and inside of the ring finger; the second goes to the outside of the ring finger, and inside of the middle finger; the third to the outside of the middle finger, and inside of the fore finger; the fourth to the outside of the index, and inside of the thumb.

Ques. 49. How does the superficial palmar arch terminate?

Ans. By a branch of communication with the radial artery.

Ques. 50. What is the general course of the radial artery?

Ans. It takes the direction of the radius; it passes over the pronator teres, and at the wrist it lays superficially between the tendons of the flexor carpi radialis, and supinator longus.

Ques. 51. What branch does it give off before it reaches the wrist.

Ans. In its course to the wrist it gives off the radial recurrent over the outer condyle, to communicate with the anastomosing branches of the brachialis; and in its course downward it supplies, by small branches, the various muscles through which it passes.

Ques. 52. What branches does the radial artery give off at the wrist?

Ans. It gives off the superficialis volæ to the ball of the thumb and palm of the hand, which often communicates with the superficial palmar arch.

Ques. 53. How does the radial artery form the deep palmar arch?

Ans. It runs backwards under the tendons of the abductor and extensors of the thumb; between the basis of the first bone of the thumb and of the metacarpal bone of the fore finger, it passes into the palms of the hand, where it forms the arcus profundus.

Ques. 54. What is the course of the arcus profundus?

Ans. It runs under the tendons of the flexor muscles close to the bones, and joins the communicating branch of the superficial arch.

Ques. 55. What branches does it give off?

Ans. It gives a branch to the thumb, and one passes from it between each metacarpal bone.

SECTION XLIV.

OF THE THORACIC ARTERIES.

Ques. 1. Enumerate the branches given off by the thoracic portion of the aorta.

Ans. It gives off the bronchial, the œsophageal, and the inferior intercostal arteries.

Ques. 2. Where do the bronchial arteries arise?

Ans. They are given off very irregularly, but they generally arise from the fore part of the aorta; there is at least one for each lung, and sometimes more.

Ques. 3. What is their course and distribution?

Ans. They pass directly to each lung, to the substance of which they are distributed.

Ques. 4. Where do the œsophageal arteries arise?

Ans. They are from three to six in number, and arise from the fore part of the aorta, and are distributed to the œsophagus.

Ques. 5. Where do the intercostal arteries arise?

Ans. They arise in pairs along the back part of the descending aorta, all the way to the diaphragm.

Ques. 6. What is their course?

Ans. They run transversely over the bodies of the vertebræ, and supply the intercostal muscles, contiguous pleura, &c.

SECTION XLV.

OF THE ABDOMINAL ARTERIES.

Ques. 1. Enumerate the arteries given off by the abdominal aorta.

Ans. They are the phrenic, the cœliac, the superior mesenteric, the emulgent, the capsular, the spermatic, the inferior mesenteric, the lumbar, and the sacral arteries.

Ques. 2. How many phrenic arteries are there, and where do they arise?

Ans. They are two in number, and arise from the aorta, between the crura of the lesser muscle of the diaphragm.

Ques. 3. What is their course and distribution?

Ans. They run along the concave side of the diaphragm, and are distributed to its fibres, and to the neighbouring parts.

Ques. 4. Where does the cœliac artery arise?

Ans. From the fore part of the aorta, immediately after its passage through the crura of the diaphragm, nearly opposite to the junction of the last dorsal with the first lumbar vertebra.

Ques. 5. What are the chief branches of the cœliac?

Ans. It divides into three great branches, viz., the coronary of the stomach, the hepatic, and the splenic.

Ques. 6. What is the course and distribution of the coronary of the stomach?

Ans. It is the least of the three branches; it passes to the left, and having reached the superior orifice of the

stomach, it returns along the lesser curvature, giving branches which surround the stomach; it communicates with the pyloric artery.

Ques. 7. What is the course and distribution of the hepatic artery?

Ans. It runs to the upper and inner part of the pylorus, there giving off, first, the pyloric artery, which is small, and a larger one; the gastro-epiploica dextra, which runs along the right side of the great curvature of the stomach, having first at the pylorus given off the duodenal artery to the duodenum; it then proceeds behind the gall ducts towards the gall bladder, to which it gives off the cystic arteries; then divides into two branches, one of which goes to the right and the other to the left lobe of the liver.

Ques. 8. What is the course and distribution of the splenic artery?

Ans. It runs towards the left, hidden behind the pancreas; towards the spleen, adhering to the pancreas, to which it gives off several branches; the pancreatica, near the extremity of the pancreas, it gives off the gastro-epiploica sinistra, to the left portion of the great curvature of the stomach; it then gives the vasa brevia to the great extremity of the stomach; and lastly, it divides into four or five considerable branches, which terminate in the spleen.

Ques. 9. Where does the superior mesenteric artery arise?

Ans. It arises from the fore part of the aorta, a little below the cœliac.

Ques. 10. What is its course and distribution?

Ans. It descends obliquely to the left, at first covered by the pancreas; it then passes over the duodenum, and enters between the two laminæ of the mesentery. In the rest of its course it takes a sweep obliquely from the left to the right, and terminates at the extremity of the ilium; by this means it forms a long arch, from which sixteen or

eighteen branches proceed, chiefly to the small intestines ; the first and last branches are shorter than the middle ones. These branches join each other by numerous arches ; the first considerable branch is the colica dextra, which, passing along the superior part of the colon, communicates with the inferior mesenteric ; the second principal branch supplies the last portion of the ilium and the first of the colon, and is called the ilio-colica.

Ques. 11. Where does the inferior mesenteric artery arise ?

Ans. It arises from the fore part of the aorta, about a finger's breadth below the spermatic arteries.

Ques. 12. What is its course and distribution ?

Ans. It divides into three or four branches ; it is distributed to the large intestines ; the first of which, communicating with the colica dextra upon the colon, is named colica senestra ; the lower branch sends off the anterior hæmorrhoidalis interna to the posterior portion of the rectum.

Ques. 13. How many emulgent arteries are there, and where do they arise ?

Ans. There are two, one for each kidney ; they arise from the sides of the aorta, immediately under the superior mesenteric.

Ques. 14. What is their course and distribution ?

Ans. The right lies more backward and is longer than the left, passing behind the vena cava ; they both lie behind the emulgent veins, and enter the substance of the kidneys behind the vein.

Ques. 15. Where do the capsular arteries arise ?

Ans. The right comes most commonly from the right emulgent, and the left from the aorta above the emulgent.

Ques. 16. What is their course and distribution ?

Ans. They pass directly, and are distributed to the renal capsules.

Ques. 17. Where do the spermatic arteries arise ?

Ans. They arise near each other from the fore part of the aorta, between the emulgents and inferior mesenteric.

Ques. 18. What is their course ?

Ans. They descend obliquely outward, giving off minute branches ; in men they pass through the abdominal ring to be distributed to the testes ; while in women they remain in the abdomen, and are distributed to the ovaria and uterus.

Ques. 19. Where do the lumbar arteries arise ?

Ans. They arise from the posterior part of the abdominal aorta, in five or six pairs.

Ques. 20. How are they distributed ?

Ans. They are distributed on each side of the loins.

Ques. 21. Where does the sacral artery arise ?

Ans. It generally arises from the bifurcation of the aorta, it is distributed to the os sacrum, contiguous peritoneum, &c. &c.

SECTION XLVI.

OF THE PELVIC ARTERIES.

Ques. 1. What arteries proceed from the termination of the aorta ?

Ans. The two iliac arteries, and the sacral ; they proceed from the aorta, opposite the junction of the fourth and fifth lumbar vertebræ.

Ques. 2. What is the course of the right primitive iliac ?

Ans. It passes first before the origin of the left iliac vein, and then descends before the right iliac vein.

Ques. 3. What is the course of the left primitive iliac ?

Ans. It descends before and to the outer side of the left vein.

Ques. 4. How are they divided ?

Ans. Opposite the union of the ilium and sacrum, each divides into an internal and external iliac artery.

Ques. 5. What is the course of the trunk of the internal iliac ?

Ans. It passes into the cavity of the pelvis, a little before the sacro-iliac junction ; and being directed a little forwards it forms a curve, whose convexity is turned downwards and backwards.

Ques. 6. What are the chief branches given off by the internal iliac ?

Ans. They are the lesser iliac, the glutæal, the sciatic, the pudic, the obturator, and the umbilical arteries.

Ques. 7. Where does the lesser iliac arteries arise ?

Ans. It is the first branch given off by the internal iliac, but sometimes it proceeds from the glutæal.

Ques. 8. What is its course ?

Ans. It passes behind the psoas, and is distributed to the iliacus internus, to the os ilium, to the quadratus lumborum, &c.

Ques. 9. Where does the glutæal artery arise ?

Ans. It is one of the greatest branches given off, and is the second branch given off by the internal iliac.

Ques. 10. What is its course and distribution ?

Ans. It passes from the pelvis, along with the sciatic nerve, through the greater sacro-ischiatic notch ; it is distributed in numerous branches to the glutæus maximus and medius.

Ques. 11. What is the third branch given off ?

Ans. The sciatic ; it is next in size to the glutæal.

Ques. 12. What is its course ?

Ans. After detaching several branches to the rectum, &c., it passes obliquely over the sciatic nerve, accompanying it through the great sacro-ischiatic notch, and descending with it along the posterior part of the thigh, and being distributed to the parts adjacent.

Ques. 13. Where does the pudic artery arise ?

Ans. It generally arises from one common trunk with the sciatic.

Ques. 14. What is its course and distribution ?

Ans. After sending branches to the bladder, rectum, &c. it quits the pelvis through the great sacro-ischiatic notch ; then passes behind the spine of the ischium, and again enters the pelvis through the lesser sacro-ischiatic notch ; it next runs on the inside of the tuberosity of the ischium, and separates into two, an inferior or perineal artery, and a superior, which is the artery of the penis. The latter runs along the branch of the ischium and pubis to the symphysis ; in this course it sends an artery to the bulb of the urethra, and having reached the symphysis pubis, it divides into two branches, one the dorsal, the other the cavernous artery of the penis ; the dorsal runs along the superior groove of the penis, the cavernous enters and is distributed within the corpora cavernosa.

Ques. 15. Where does the obturator artery arise ?

Ans. Its origin varies ; sometimes it arises from the internal iliac, and sometimes from the lesser iliac ; now and then from the epigastric, and but rarely from the external iliac.

Ques. 16. What is its course and distribution ?

Ans. It passes from the pelvis at the upper part of the ligament of the foramen ovale, and is distributed to the pectineus and triceps.

Ques. 17. What is there peculiar to the umbilical artery ?

Ans. It is important to the fœtus, but is nearly obliterated in the adult.

Ques. 18. What is its course?

Ans. It ascends on the side of the bladder, giving branches to it, the peritoneum, and contiguous parts; it then assumes the form of a ligament, and passes upwards to the umbilicus.

Ques. 19. What is the course of the external iliac?

Ans. It descends on the iliac muscle as far as Poupart's ligament.

Ques. 20. What branches does it give off?

Ans. It gives off two; namely, the epigastric, and circumflexa ilii.

Ques. 21. Where does the epigastric artery arise?

Ans. It arises internally from the external iliac, as it passes under Poupart's ligament.

Ques. 22. What is its course?

Ans. It ascends obliquely behind the tendon of the transversalis abdominis, toward the posterior part of the rectus, behind which it runs, giving branches to the contiguous parts; and terminates by anastomosing with the internal mammary artery. It is important that in cases of hernia, the surgeon should be aware that it sometimes gives off the obturator artery.

Ques. 23. Where does the circumflexa ilii arise?

Ans. It arises from the outer side of the external iliac, under Poupart's ligament.

Ques. 24. What is its course?

Ans. It passes to the inner labium of the crista of the ilium, where it is distributed to the abdominal muscles.

SECTION XLVII.

OF THE ARTERIES OF THE LOWER EXTREMITIES.

Ques. 1. Where does the femoral artery commence?

Ans. The femoral artery is the name given to the external iliac immediately after it has passed under Poupart's ligament.

Ques. 2. What is its course?

Ans. It descends over the brim of the pelvis and head of the os femoris; it is placed on the inside of the femoral vein; in this part of its course it is covered only by the skin, fat, and glands; it then descends between the sartorius, vastus internus, and triceps, being covered for a great part of the way by the former. Below the middle of the thigh it passes through the tendinous part of the triceps, then over the inner ridge of the linea aspera, and below the tendon of the triceps into the ham, where it forms the popliteal artery.

Ques. 3. What branches does it send off in the groin?

Ans. It sends branches to the inguinal glands, one or two to the parts of generation, called the external pudic; others to the muscles near the groin, and the profunda.

Ques. 4. Where is the profunda given off?

Ans. It arises about four inches below Poupart's ligament, from the posterior part of the femoral artery; it is nearly equal in size to the femoral artery.

Ques. 5. What is its course and distribution?

Ans. It passes deep, betwixt the adductors and vastus internus; it gives off high up, first, the circumflexa interna, distributed to the pectinalis, triceps, and obturator, and anastomoses with the obturator artery; second, the

circumflexa externa, near the former, which is distributed to the external and upper part of the thigh, anastomosing with the glutæal; third, the perforantes, usually three in number, sent off lower down and posteriorly; they perforate the triceps, and are distributed to the back part of the thigh.

Ques. 6. What name does the femoral artery assume in the hams?

Ans. It assumes the name of popliteal.

Ques. 7. What branches does it give off?

Ans. It gives off two superiorly, called the superior articular, which pass to the upper part of the knee joint; two inferiorly, to the lower part of the knee joint, called the inferior articular; and one or two between these, called the middle articular.

Ques. 8. How does it terminate?

Ans. It divides into two principal branches; namely, the anterior and posterior tibial arteries.

Ques. 9. What is the course of the anterior tibial?

Ans. It passes between the heads of the tibia and fibula, through the interosseous ligament; then descends on its fore part, between the tibialis anticus and extensor digitorum; passes under the common annular ligament; and advances on the convex side of the foot as far as the interstice between the first and second metatarsal bones.

Ques. 10. How is the anterior tibial artery distributed?

Ans. As it passes between the tibia and fibula it gives off several small branches; it gives off numerous others as it descends upon the leg, and over the upper part of the foot; at its termination it sends off a large branch between the heads of the first and second metatarsal bones, to join the posterior tibial; it also sends several branches over the metatarsal bones, and a considerable one to each side of the great toe.

Ques. 11. What is the course of the posterior tibial artery?

Ans. It descends between the soleus, tibialis posticus, flexor digitorum communis, and flexor longus pollicis ; it then runs behind the inner ankle, and passes to the sole of the foot through the concavity of the os calcis, where it divides into the external and internal plantar arteries.

Ques. 12. How is it distributed ?

Ans. It gives branches to the muscles as it descends, and the nutrient artery to the bone ; it also communicates behind the inner ankle with the anterior tibial.

Ques. 13. What is the course and distribution of the external plantar artery ?

Ans. It passes on the concavity of the os calcis obliquely under the sole of the foot, to the base of the fifth metatarsal bone ; thence it runs across, forming the plantar arch, toward the great toe, where it communicates with the large branch of the anterior tibial ; from the convex side of this plantar arch, branches proceed to the outside of the second toe and to both sides of the three last ones, in the same way as the digital arteries of the hand are given off.

Ques. 14. What is the course and distribution of the internal plantar artery.

Ans. Having passed beyond the middle of the sole of the foot it divides, sending one branch to the great toe, where it communicates with the branch of the anterior tibial, and another to the first phalanges of the other toes, communicating with the branches of the arch.

Ques. 15. What is the course and distribution of the fibular artery ?

Ans. It descends on the back of the fibula, between the soleus and flexor longus pollicis, giving rami in its course, and about the lower third of the fibula it sends a branch between it and the tibia to the integuments of the tarsus : between the astragalus and tendo-Achilles, it forms an arch with the posterior tibial ; thence running outward and above the external ankle it communicates with the anterior tibial, and sends off several rami.

SECTION XLVIII.

OF THE VEINS IN GENERAL.

Ques. 1. What are the veins ?

Ans. They are those blood vessels by which the blood is returned to the heart from the different parts of the body.

Ques. 2. How are they distinguished from the arteries ?

Ans. They are distinguished by being more transparent, less elastic, collapsing when cut across, and having no pulsation.

Ques. 3. Where do the veins begin ?

Ans. They arise from the extreme branches of the arteries, except in the spleen, corpora cavernosa, penis, and clitoris ; where they begin by open mouths in the cells of those parts.

Ques. 4. How are they distributed ?

Ans. Their mode of distribution is similar to that of the arteries ; they are, however, more numerous, and larger.

Ques. 5. What is their structure ?

Ans. Their structure is similar to that of the arteries ; but their coats, especially the elastic coat, are thinner.

Ques. 6. What are the valves of the veins ?

Ans. Their internal or cuticular coat forms occasionally semilunar folds, called valves.

Ques. 7. How are these valves disposed ?

Ans. They are arranged in pairs, having their concave sides turned towards the heart, and their straight edges meet when distended.

Ques. 8. What veins are without valves ?

Ans. They are not found in the veins of the head or viscera.

Ques. 9. What is the use of these valves ?

Ans. They allow the blood to flow towards the heart, but prevent its taking an opposite course ?

Ques. 10. How many principal venous trunks are there ?

Ans. There are six trunks which return the blood to the auricles of the heart, which the pulmonary artery and aorta had conveyed from the ventricles.

Ques. 11. Enumerate the venous trunks.

Ans. The four pulmonary veins return the blood from the lungs to the left auricle ; the superior and the inferior cava bring back to the right auricle that which has been distributed by the aorta.

Ques. 12. What are the veins peculiar to the heart ?

Ans. The heart has one vein only, called the coronary, which opens into the posterior and inferior part of the right auricle, very near the septum auriculorum.

SECTION XLIX.

THE SUPERIOR CAVA.

Ques. 1. Where does the superior cava arise ?

Ans. It arises from the superior part of the right auricle, where it is surrounded by the pericardium.

Ques. 2. How does it terminate ?

Ans. It ascends a little to the right and backwards, and terminates behind the cartilage of the first rib by dividing into two branches, called the subclavian veins.

Ques. 3. What veins does the superior cava receive ?

Ans. It receives the vena azygos, the right internal mammary vein, and several lesser branches.

Ques. 4. What is the vena azygos ?

Ans. It is the trunk of the intercostal veins of the right side, and of the inferior intercostals of the left.

Ques. 5. What is its course ?

Ans. It crosses from the left to the right, ascends on the right side of the bodies of the vertebræ, passes behind and above the root of the right lung, and enters the posterior part of the vena cava.

Ques. 6. What veins does the right subclavian receive ?

Ans. It receives three vessels, viz., the external jugular, the internal jugular, and the vertebral.

Ques. 7. What is peculiar to the left subclavian ?

Ans. It is by much the longest, passes before and across the arteries going to the head, and receives, besides the same veins as the right, the trunk of the left superior intercostals and the left internal mammary.

Ques. 8. What is the axillary vein ?

Ans. It is a continuation of the subclavian, and receives the blood of the veins, which correspond to the branches of the axillary artery.

SECTION L.

OF THE VEINS OF THE HEAD AND NECK.

Ques. 1. What veins does the external jugular receive?

Ans. It receives the blood of the following veins, viz., of the frontal vein, from the forehead; the angular vein from about the inner angle of the eye; the temporal vein, from the temple; the auricular vein, from the ear; the lingual vein, from the tongue; the occipital vein, from the occiput; and the supra-humeral vein, from the scapulæ.

Ques. 2. What is its course and termination?

Ans. It runs superficially down the neck over the muscles, and passing behind the clavicle, it terminates generally in the subclavian of the same side, but sometimes in the axillary, and sometimes in the union of these two.

Ques. 3. How is the internal jugular formed?

Ans. It receives branches from the fascial and temporal, but is chiefly formed by the sinuses of the dura mater.

Ques. 4. What are the chief sinuses of the dura mater?

Ans. They are the cavernous, the circular, the superior and inferior petrosal, the occipital, the inferior longitudinal, the torcular herophili, and the superior longitudinal.

Ques. 5. Where is the cavernous sinus situated?

Ans. It is situated on each side of the sella turcica, at the apex of the petrous portion of the temporal bone.

Ques. 6. Whence does it receive its blood?

Ans. It receives its blood from the great ophthalmic veins.

Ques. 7. Where is the circular sinus situated?

Ans. It is situated around the pituitary gland.

Ques. 8. Where is the superior petrosal sinus situated?

Ans. It is placed in the groove of the ridge of each os petrosum.

Ques. 9. From whence do they receive their blood?

Ans. From the cavernous and circular sinuses.

Ques. 10. Where is the inferior petrosal sinus situated?

Ans. Along the suture, formed by the os petrosum and os occipitis.

Ques. 11. From whence does it receive its blood?

Ans. From the cavernous and circular sinuses.

Ques. 12. Where is the occipital sinus situated?

Ans. It is placed in the inferior portion of the internal crucial spine of the os occipitis.

Ques. 13. From whence does it receive its blood?

Ans. From the cerebellum.

Ques. 14. Where is the inferior longitudinal sinus situated?

Ans. On the lower edge of the falx.

Ques. 15. Where is the torcular herophili situated?

Ans. In the junction of the falx and tentorium.

Ques. 16. From whence does it receive its blood?

Ans. From the inferior longitudinal sinus, and from the vena magna galeni.

Ques. 17. Where is the superior longitudinal sinus situated?

Ans. In the furrow of the spine of the os frontis, upper edges of the parietal bones, and superior portion of the internal crucial ridge of the os occipitis.

Ques. 18. Where are the lateral sinuses placed?

Ans. They are placed along the posterior edge of the tentorium, in the grooves of the lateral portions of the crucial ridge of the os occipitis; in those on the inside of the posterior inferior angle of the parietal bones; in those of the inside of the mastoid portions of the temporal bones; and in those which are situated on each side of the foramen magnum of the occipital bone.

Ques. 19. From whence do they receive their blood?

Ans. From the superior longitudinal, torcular herophili occipital, and petrosal sinuses.

Ques. 20. Where do they terminate?

Ans. At the jugular foramina, where the internal jugular veins begin.

Ques. 21. What is the course of the internal jugular veins?

Ans. They descend by the sides of the cervical vertebræ, along the edges of the longus colli, behind the sterno and omo hyoideus, behind the external extremity of the clavicle.

Ques. 22. Where do they terminate?

Ans. They terminate in the subclavian veins.

Ques. 23. What is the course of the vertebral vein?

Ans. It accompanies the vertebral artery through the foramina of the transverse processes of the cervical vertebræ.

Ques. 24. From whence does it receive its blood?

Ans. It does not enter the cranium with the vertebral artery, but receives blood from the lateral sinuses, through the foramen condyloideum posterius and foramen mastoideum, and from the vertebral canal.

Ques. 25. Where does it terminate?

Ans. It terminates in the upper and posterior part of the subclavian vein.

SECTION LI.

OF THE VEINS OF THE UPPER EXTREMITIES.

Ques. 1. How are the veins of the upper extremities classed?

Ans. They are divided into the deep-seated, and the superficial.

Ques. 2. What is the situation of the deep-seated veins?

Ans. They accompany the arteries, and receive the same names.

Ques. 3. What are the names of the deep-seated veins?

Ans. Those of the upper extremity are, one axillary vein, two brachial, two radial, two interosseal, and two ulnar veins.

Ques. 4. Where are the superficial veins situated?

Ans. They lie under the skin, and follow an irregular course.

Ques. 5. What are their names?

Ans. Those of the superior extremity are the cephalic and the basilic.

Ques. 6. Where is the cephalic situated?

Ans. Along the outer and fore part of the arm and forearm.

Ques. 7. What branches does the cephalic vein receive?

Ans. At the extremity of the radius it receives branches from the back part of the hand, toward the thumb; between the thumb and the metacarpus it receives the cephalica pollicis; and a little below the bend of the arm, the mediana cephalica.

Ques. 8. Where does it terminate?

Ans. It ascends before the external condyle of the humerus, along the outside of the biceps muscle ; passes between the pectoralis major and deltoid, and terminates in the axillary vein.

Ques. 9. What is the situation of the basilic vein ?

Ans. It is situated along the inner and fore part of the arm and forearm.

Ques. 10. What are the chief branches it receives ?

Ans. It receives branches from the back part of the hand, towards the little finger ; passes over and around the internal part of the forearm, and internal condyle of the humerus, above which it receives the mediana basilica, and runs along the inner edge of the biceps ; it terminates in the axillary vein.

Ques. 11. What is the situation of the median vein ?

Ans. It is situated between the cephalic and basilic veins.

Ques. 12. How does it divide ?

Ans. It divides into two great branches, about the middle of the forearm ; namely, the mediana cephalica, and mediana basilica ; which join the cephalic and basilic veins.

Ques. 13. What is the chief branch which joins it ?

Ans. It receives the vena profunda, a branch of communication with the deep-seated veins.

SECTION LII.

OF THE INFERIOR CAVA.

Ques. 1. What is the origin of the inferior vena cava ?

Ans. It is larger than the superior, and from the inferior part of the right auricle of the heart.

Ques. 2. What is its course ?

Ans. It pierces the diaphragm ; is placed in a notch at the posterior part of the liver ; descends along the bodies of the vertebra to the right side of the aorta, and opposite the junction of the fourth and fifth lumbar vertebræ it divides into two branches, called the iliac veins.

Ques. 3. What veins is received by the vena cava ?

Ans. It receives in its course the following veins, viz., the two phrenic, or diaphragmatic veins ; next, the four hepatic veins ; and lower down, the two emulgent and the spermatic veins ; and lastly, the lumbar veins.

Ques. 4. Where do the hepatic veins enter the cava ?

Ans. They enter the anterior part of the inferior cava, just where it passes behind the liver.

Ques. 5. What is the course of the emulgent veins ?

Ans. They are the veins of the kidneys ; the left is the longest ; passes before the aorta, and receives the left spermatic vein.

Ques. 6. What are the terminations of the spermatic veins ?

Ans. They correspond with the arteries of that name ; the right enters the vena cava, the left opens into the left emulgent.

Ques. 7. What is the course of the primitive iliac veins ?

Ans. They follow the distribution of the iliac arteries.

Ques. 8. Into what branches do they divide?

Ans. They divide at the sacro-iliac junction into the internal and external iliac.

Ques. 9. From whence does the internal iliac receive its blood?

Ans. From the veins which correspond to, and accompany the various branches of, the internal iliac artery.

Ques. 10. What veins does the external iliac vein receive?

Ans. It accompanies the artery, and is situated at its inner side; it receives the veins of the lower extremities.

SECTION LIII.

OF THE VEINS OF THE LOWER EXTREMITIES.

Ques. 1. How are the veins of the lower extremities arranged?

Ans. Like those of the upper, they are divided into a deep-seated and a superficial set.

Ques. 2. What are the deep-seated veins of the lower extremity?

Ans. They are the femoral, popliteal, two posterior tibial, two anterior tibial, and two interosseal veins.

Ques. 3. What are the names of the superficial veins?

Ans. They are the saphena major and saphena minor.

Ques. 4. What is the situation of the saphena major?

Ans. It is situated on the inner part of the foot, knee, and thigh.

Ques. 5. What branches does it receive in its course?

Ans. It receives branches from the upper part of the back of the foot, towards the great toe; runs over the malleolus internus, along the inner part of the tibia, just behind the internal condyle of the femur, and follows the direction of the sartorius up the thigh, receiving branches in its course.

Ques. 6. Where does it terminate?

Ans. It terminates in the crural vein, a little below Poupart's ligament.

Ques. 7. What is the course of the saphena minor?

Ans. It begins on the outside of the foot, ascends on the same side of the tendo-Achillis and gastrocnemius, and enters the ham.

Ques. 8. Where does it terminate?

Ans. It terminates in the upper part of the popliteal vein.

SECTION LIV.

OF THE VENA PORTÆ.

Ques. 1. What is the vena portæ?

Ans. It is a vein of great size, peculiar to the liver, and which has two sets of branches.

Ques. 2. What is the vena portæ addominalis?

Ans. It is one set of the vena portæ, which is distributed over the stomach, intestines, spleen, and pancreas, accompanying the arteries of these parts, and receives their blood.

Ques. 3. What is the *vena portæ hepatica*.

Ans. It is the other set of the branches of the *vena portæ*, which is ramified through the substance of the liver, secretes the bile, and terminates in the hepatic veins.

Ques. 4. What is the situation of the trunk of the *vena portæ*?

Ans. It is situated partly in the transverse fissure of the liver, where it is called the sinus of the *vena portæ*; and partly it is contained in Glisson's capsule.

Ques. 5. How is the trunk of the *vena portæ* formed?

Ans. It is formed by three considerable veins; namely, the *vena mesenterica major*, the *vena splenica*, and the *vena mesenterica minor*, or *hæmorrhoidalis interna*.

Ques. 6. Where does the *vena mesenterica major* derive its blood?

Ans. It receives blood from the veins corresponding to the superior mesenteric artery.

Ques. 7. What veins does the *splenica* receive?

Ans. It receives blood from the spleen, and from a branch of the coronary vein of the stomach, the pancreatic veins, and the *gastro-epiploica sinistra*.

Ques. 8. Where does the *mesenterica minor* or inferior derive its blood?

Ans. It obtains its blood from the inferior mesenteric and some branches of the *cœliac* arteries.

Ques. 9. What lesser veins join the trunk of the *vena portæ*?

Ans. It receives the cystic, the pyloric, and the duodenal veins; as also the *gastrica dextra* and the coronary vein of the stomach.*

* * Having now finished the examinations on the venous system, I have to remark that I have followed the usual plan of commencing with the heart, in the same way as the arteries are described. As the veins return the blood to the heart, the more proper plan would be to commence at the extremities, and follow up their course to the right auricle of the heart; in order however not to confuse the minds

SECTION LV.

OF THE ABSORBENT SYSTEM IN GENERAL.

Ques. 1. What are the absorbents ?

Ans. They are a numerous set of minute transparent vessels, distinct from the blood-vessels, which take up the nutritive part of our food, and the various fluids and solids of the living body, to make way for the deposit of fresh matter.

Ques. 2. What division has been made of the absorbents ?

Ans. They are divided into lacteals and lymphatics.

Ques. 3. What difference is there betwixt the lacteals and lymphatics ?

Ans. This distinction has arisen only from the colour of their contents. The lacteals contain a milk-like fluid, the chyle ; they are the absorbents of the small intestines. All the other absorbents of the body are called lymphatics, containing lymph.

Ques. 4. How do the absorbents begin ?

Ans. They begin by minute open mouths ; first, from all the internal cavities ; secondly, from the cellular membrane and every interstice ; thirdly, from the ducts and glands ; fourthly, from the surface of the skin, stomach, intestines, &c.

Ques. 5. What is their general course ?

Ans. They follow the general course of the veins ; in the limbs there is a deep-seated and a superficial set.

of young students, I have followed the old arrangement, leaving it to themselves to reverse that arrangement, which can very readily be accomplished.

Ques. 6. How do they terminate ?

Ans. They terminate by two trunks behind the middle of each clavicle, in the subclavian vein, near the angle formed by it and the internal jugular.

Ques. 7. What is the thoracic duct ?

Ans. The left is the principal trunk, and is called the thoracic duct; it receives all the absorbents of the body, excepting those of the right arm and right side of the head, which forms the right trunk.

Ques. 8. What is the structure of the absorbents ?

Ans. They are very thin and transparent, but remarkably dense, and stronger than the veins.

Ques. 9. How many coats have they ?

Ans. They have a muscular and cuticular coat.

Ques. 10. How is the cuticular coat disposed ?

Ans. It is the most internal, and forms numerous pairs of valves in every absorbent vessel.

Ques. 11. What are the lymphatic glands ?

Ans. They are an important part of the absorbent system. They are small glandular bodies, through which the absorbents convey their contents before they terminate in the common trunks.

Ques. 12. Where are they situated ?

Ans. They are found in clusters in various parts of the body; as just below the occiput, under the ears and jaw, along the side of the neck, behind the clavicle in the axilla, and two or three near the elbow; in the thorax, the bronchial glands, and at the root of the lungs; in the abdomen, called mesenteric glands, belonging to the lacteals; in the loins and pelvis; in the inguinal region; and two or three in the ham.

Ques. 13. What are the vasa inferentia and vasa efferentia ?

Ans. The absorbents which enter a gland are called vasa inferentia; they are more numerous than those

which pass out of the gland, and are called vasa efferentia.

Ques. 14. What is the structure of these glands?

Ans. They appear to be of cellular structure, and not composed of convoluted absorbents, as has been alleged.

SECTION LVI.

OF THE LYMPHATICS OF THE HEAD AND NECK.

Ques. 1. How are the lymphatics of the head and neck classed?

Ans. They are divided into the facial, temporal, occipital, and thyroideal lymphatics.

Ques. 2. What is the course of the facial lymphatics?

Ans. They accompany the trunk and branches of the facial blood-vessels, and pass through several small glands situated in their course.

Ques. 3. What is the course of the temporal lymphatics?

Ans. They accompany the temporal blood-vessels, and pass through glands at the root of the zygomatic process.

Ques. 4. What is the course of the occipital lymphatics?

Ans. They accompany the occipital blood-vessels, pass through glands behind the mastoid process, and descend with the others along the external and internal jugular veins, to join the lymphatics of the upper extremities.

Ques. 5. What is the course of the thyroideal lymphatics ?

Ans. They descend on each side of the trachea through the cervical glands to the commencement of the thoracic duct.

Ques. 6. Are there any lymphatics in the brain ?

Ans. Lymphatics have never been demonstrated in the brain, but their existence is not doubted.

SECTION LVII.

OF THE LYMPHATICS OF THE UPPER EXTREMITIES.

Ques. 1. What is the course of the superficial lymphatics of the upper extremity ?

Ans. They follow the course of the cephalic and basilic veins ; those accompanying the basilic enter two or three glands just above the internal condyle of the os humeri.

Ques. 2. What is the course of the deep-seated lymphatics ?

Ans. They accompany the arteries ; there being three or four, or more lymphatic trunks to each artery.

Ques. 3. How do the lymphatics of the upper extremity terminate ?

Ans. They all terminate in the axillary lymphatic trunk.

Ques. 4. Where does the left axillary lymphatic trunk terminate ?

Ans. It opens into the thoracic duct.

Ques. 5. Where does the right axillary lymphatic trunk terminate ?

Ans. It terminates by a second trunk common to it and the lymphatics of the right side of the head.

SECTION LVIII.

OF THE LYMPHATICS OF THE LOWER EXTREMITIES.

Ques. 1. What is the course of the superficial lymphatics of the lower extremities ?

Ans. They follow the course of the saphena major and minor veins. Those accompanying the saphena minor enter two or three glands placed in the ham.

Ques. 2. What is the course of the deep-seated lymphatics of the lower extremities ?

Ans. They accompany the arteries ; several lymphatic trunks are found with each artery.

SECTION LIX.

OF THE LYMPHATICS OF THE TRUNK.

Ques. 1. Describe the lymphatics of the pelvis.

Ans. The lymphatics from the nates, and from the organs of generation, pass through the inguinal glands; then under Poupart's ligament to glands situated at the brim of the pelvis. Those from the testicles pass along the spermatic chord to the lumbar glands; those from the cavity of the pelvis generally proceed along the internal iliac arteries; and a third set ascends upon the psoas magnus. At the posterior part of the pelvis they collect toward the right side, forming a plexus in the right lumbar region, and at the third lumbar vertebra they unite, and being soon joined by the lacteals form the receptaculum chyli.

Ques. 2. Describe the lymphatics of the abdomen.

Ans. The abdominal lymphatics from the kidneys proceed through glands to a considerable vessel near the aorta; those from the spleen pass along with its artery; those from the pancreas join the lymphatics of the spleen; those from the stomach in part join those of the spleen; others follow the course of the coronary artery, being joined by vessels from the liver; those of the liver either ascend its broad ligament, or join the deep-seated vessels, or ascend in trunks behind the sternum. The lymphatics of the intestines are called lacteals; they run through glands placed in the mesentery to the receptaculum chyli.

Ques. 3. Describe the lymphatics of the lungs.

Ans. They are either superficial or deep-seated; and passing through the bronchial glands they partly join the

thoracic duct behind the bifurcation of the trachea ; while some of those from the right lung ascend in a trunk before the superior cava, and terminate in the great lymphatic vessel which opens between the right subclavian and jugular vein ; and others from the left, passing behind the arch of the aorta, terminate near the end of the thoracic duct. The lymphatics of the heart accompany the coronary vessels, and those of the left side terminate with the last-mentioned lymphatics of the lungs, while those of the right terminate between the right subclavian and jugular veins.

SECTION LX.

OF THE LACTEAL SAC AND DUCT.

Ques. 1. Where is the lacteal sac situated ?

Ans. It is situated on the body of the first lumbar vertebra, behind the right crus of the diaphragm and above the right renal artery.

Ques. 2. What is its form ?

Ans. It is irregularly oval, diminishing towards its upper part ; being about an inch in length and a third of an inch in breadth.

Ques. 3. In what does the lacteal sac terminate ?

Ans. In the thoracic duct, which proceeds from the upper part of the lacteal sac.

Ques. 4. What is the course of the thoracic duct?

Ans. It passes between the crura of the diaphragm and beneath the right side of the aorta, and ascends between that vessel and the vena azygos to the fifth dorsal vertebra, where that vein in its passage to join the cava covers it. The duct then passes behind the œsophagus and the curvature of the aorta to the left side, till behind the left carotid artery, and on that side of the œsophagus it ascends to the first or second dorsal vertebra, and leaving the carotid makes a circular turn and divides; uniting again almost immediately, it descends.

Ques. 5. Where does the thoracic duct terminate?

Ans. Behind the internal jugular vein, in the upper part of the subclavian vein.

Ques. 6. How is its orifice protected?

Ans. Its opening into the vein is guarded by two semilunar valves.

NEUROLOGY.

SECTION LXI.

OF THE NERVES IN GENERAL.

Ques. 1. What are the nerves ?

Ans. They are long, firm, white chords, which ramify after the manner of the blood-vessels, to be distributed to all parts of the body.

Ques. 2. From what parts do they arise ?

Ans. From the brain, medulla oblongata, and medulla spinalis.

Ques. 3. What is the general course and distribution of the nerves ?

Ans. They follow the course and distribution of the arteries, arising in pairs, and dividing into branches and ramifications.

Ques. 4. What communication have the different nerves with each other ?

Ans. They anastomose ; and in some parts their mutual communications are numerous, forming a plexus ; at others a knot, called ganglion, is found in the course of a nerve, from which numerous branches arise.

Ques. 5. What is the structure of the nerves ?

Ans. They consist of fasciculi, or bundles of distinct longitudinal fibres, closely connected together by cellular substance.

Ques. 6. What are the coverings of the nerves ?

Ans. Their membranous coverings are said to be continuations of those which envelop the brain and spinal marrow ; these are distinct at their origin, but afterwards a firm cellular texture only appears to surround them.

Ques. 7. How are the nerves nourished ?

Ans. They are well supplied with blood-vessels.

Ques. 8. What is the structure of the ganglions ?

Ans. They are of reddish grey colour, of firm consistence, and formed by a close intertexture of filiaments.

Ques. 9. How are the nerves classed ?

Ans. They are divided into cerebral, of which there are ten pairs ; and spinal, of which there are thirty pairs ; besides these, the great sympathetic nerve.

Ques. 10. How do the cerebral nerves pass out of the cranium.

Ans. They pass out through various holes, in the basis of the cranium.

Ques. 11. How do the spinal nerves pass out of the vertebral canal ?

Ans. They pass out through the lateral foramina of the vertebræ, and the anterior foramina of the os sacrum.

Ques. 12. Enumerate the cerebral nerves.

Ans. The ten pairs of cerebral nerves are, the first pair, or olfactory nerves ; the second pair, or optic nerves ; the third pair, or motores oculorum ; the fourth pair, or pathetici ; the fifth pair, or trigemini ; the sixth pair, or motores externi ; the seventh pair, or auditory nerves ; the eighth pair, or par vagum ; the ninth pair, or lingual nerves ; and the tenth pair, or suboccipital nerves.

Ques. 13. How are the spinal nerves divided ?

Ans. They are divided into cervical, dorsal, lumbar, and sacral.

SECTION LXII.

OF THE CEREBRAL NERVES.

First Pair.

Ques. 1. Where do the olfactory nerves arise ?

Ans. They arise from the corpora striata.

Ques. 2. What is their course within the cranium ?

Ans. They pass forward on each side of the crista galli, becoming gradually larger and softer, and reach the os æthmoides without any communication between them.

Ques. 3. How do they pass out of the cranium ?

Ans. They split into a great number of filaments, and pass out of the cranium through the holes of the cribriform plate of the æthmoid bone.

Ques. 4. What is the distribution of the olfactory nerves ?

Ans. They are ramified on the membrane lining the septum narium, and the rest of the cavity of the nose.

Ques. 5. What are the communications of the olfactory with other nerves ?

Ans. They communicate by several filaments with the ophthalmic and superior maxillary nerves.

Second Pair.

Ques. 6. Whence do the optic nerves arise ?

Ans. They are the largest of the cervical pairs, and arise from the thalami nervorum.

Ques. 7. What is their course within the cranium ?

Ans. They first pass outward, then approach each other ; unite before the sella turcica, and again separate.

Ques. 8. How do they pass out of the cranium ?

Ans. They quit the cranium through the foramina optica.

Ques. 9. What is their distribution ?

Ans. They pass to and enter the globe of the eye, in order to form the retina.

Third Pair.

Ques. 10. Whence do the third pair arise ?

Ans. The third pair, or *motores oculorum*, arise from the *crura cerebri*, just before the anterior edge of the *pons varolii*.

Ques. 11. What is their course within the cranium ?

Ans. They perforate the *dura mater* behind the sides of the posterior *clynoid process*, and run along the upper part of the *cavernous sinus*.

Ques. 12. How do they pass out of the cranium ?

Ans. They pass out of the cranium through the *foramen lacerum orbitale superius*.

Ques. 13. Enumerate the branches of the *motores oculorum*.

Ans. Each sends, first, a branch to the *rectus superior*, which gives a *ramus* to the *levator palpebræ superioris* ; secondly, a branch to the *rectus internus* ; thirdly, a branch to the *rectus inferior* ; fourthly, the longest branch, to the *obliquus inferior* ; fifthly, a branch to the *lenticular ganglion*.

Ques. 14. What is the course and distribution of the *ciliary plexus* ?

Ans. From the *lenticular ganglion* proceed several *filaments*, forming the *ciliary plexus* ; they surround the *optic nerve*, perforate the *sclerotic coat*, and run between it and the *choroid* as far as the *iris*, to which they are distributed.

Fourth Pair.

Ques. 15. Whence do the pathetici arise?

Ans. They are the smallest pair, and arise behind the nates.

Ques. 16. What is their course within the cranium?

Ans. They pass on each side to the edge of the tentorium, within which they are concealed, and along the upper part of the cavernous sinus.

Ques. 17. Where do they pass out of the cranium?

Ans. Through the foramen lacerum orbitale inferius.

Ques. 18. What is their distribution?

Ans. They terminate in the obliquus superior.

Fifth Pair.

Ques. 19. Whence do the trigemini arise?

Ans. From the sides of the pons varolii, by numerous distinct filaments.

Ques. 20. What is their course within the cranium?

Ans. They pass toward the point of the os petrosum, where each perforates the dura mater a little below the commencement of the tentorium, and forms a flat semilunar ganglion.

Ques. 21. What are the branches of the trigemini?

Ans. From its semilunar ganglion each gives off three great branches; namely, the first, or ophthalmic; the second, or superior maxillary; the third, or inferior maxillary.

Ques. 22. How does the ophthalmic branch pass out of the cranium?

Ans. It passes through the foramen lacerum orbitale superius.

Ques. 23. Where does the superior maxillary pass out?

Ans. Through the foramen rotundum to the upper jaw.

Ques. 24. Where does the inferior maxillary pass out?

Ans. Through the foramen ovale, towards the lower jaw.

Ques. 25. What is the distribution of the rami of the ophthalmic branch?

Ans. It sends off, first, a frontal branch through the superciliary notch to the forehead; secondly, a nasal branch towards the inner canthus, to the lachrymal sac, and parts adjacent; sending branches through the internal orbital foramina, one of which takes a circuitous course to the tip of the nose; thirdly, a lachrymal branch to the lachrymal gland; fourthly, some branches of communication to the lenticular ganglion and to the fourth pair.

Ques. 26. What is the distribution of the rami of the maxillary branch?

Ans. It sends off, first, the pterygoid branch through the pterygoid foramen, to join the portio dura of the seventh pair; secondly, the spino-palatine to the nose, through the foramen of that name; thirdly, the palatina, down the palatine foramen to the palate; fourthly, the infra orbital through the canal of that name, to the cheek and upper lip; fifthly, filaments to the teeth of the upper jaw.

Ques. 27. What is the distribution of the rami of the inferior maxillary branch?

Ans. It sends off, first, a temporal branch; secondly, a branch to the cheek; thirdly, a lingual branch,—this is the true gustatory nerve; its branches terminating in the papillæ of the tongue; fourthly, the dental branch, which is the continuation of this nerve; it enters the canal of the lower jaw, is distributed to the teeth, and comes out at the chin, through the mental foramen.

Sixth Pair.

Ques. 28. Where do the *motores externi* arise?

Ans. They arise between the *pons varolii* and the *corpora olivaria*.

Ques. 29. What is their course within the cranium?

Ans. They advance to the *dura mater*, and perforate it on one side of the junction of the *sphænoid* and *occipital* bones; they then run through the *cavernous sinus*, by the side of the *carotid arteries*, to which they closely adhere, and also communicate with a branch of the fifth pair; they likewise send back a filament along the *carotid artery*, accompanying it in its canal, and joining the great *sympathetic*.

Ques. 30. How do they quit the cranium?

Ans. Through the *foramen lacerum orbitale superius*.

Ques. 31. What is their distribution?

Ans. They are each distributed wholly to the *rectus externus oculi*.

Seventh Pair.

Ques. 32. Where do the *auditory nerves* arise?

Ans. They arise from the lateral and posterior part of the *pons varolii*.

Ques. 33. What is their course within the cranium?

Ans. They pass into the *meatus auditorius internus* of the ear on each side.

Ques. 34. Of what portions do they consist?

Ans. Each consists of two portions; namely, the *portio mollis*, and *portio dura*.

Ques. 35. What is the relative situation of the two portions?

Ans. The *portio dura*, small and firm, is placed ante-

riorly; the portio mollis, larger and softer, is situated more posteriorly.

Ques. 36. What is the distribution of the portio mollis?

Ans. It enters the organ of hearing at the basis of the cochlea, and inner side of the vestibulum, and is alone distributed to the labyrinth.

Ques. 37. How does the portio dura pass out of the cranium?

Ans. Through the fallopian aqueduct, and stylo-mastoid foramen.

Ques. 38. What filaments does the portio dura give off within the fallopian aqueduct?

Ans. It first gives filaments through the small hole on the superior surface of the os petrosum, to join the pterygoid nerve; then one to the stapedius, and as it goes out, another, which passing through the tympanum, is called chorda tympani, and joins the lingual branch of the inferior maxillary nerve.

Ques. 39. What great branches does the portio dura give off where it emerges from the foramen stylo-mastoidium?

Ans. On quitting the stylo-mastoid foramen, the portio dura forms a plexus, whose branches are widely distributed over the side of the head and neck, to the temple, to the eye-lids, cheeks, nose, lips, chin, head, and neck, forming what has been called the pes anserinus.

Ques. 40. With what nerves does the portio dura communicate?

Ans. It freely communicates with the three branches of the fifth pair, and with the cervical nerves.

Ques. 41. What is Sir Charles Bell's opinion in regard to the portio dura?

Aus. That it is the superior respiratory nerve of the face.

Eighth Pair.

Ques. 42. Where does the par vagum or pneumogastric nerve arise?

Ans. From the corpora olivaria, laterally.

Ques. 43. Of what portions does the eighth pair consist?

Ans. At its commencement it consists of two separate portions; the first called the glosso-pharyngeal nerve, and the second the true par vagum.

Ques. 44. How do the eighth pair of nerves pass out of the cranium?

Ans. They run towards the jugular foramen before the extremity of the lateral sinus, from which the nerve on each side is separated by two small bony prominences, and a membranous septum; here the glosso-pharyngeal nerve is situated before the par vagum, and separated from it by a thin membranous septum.

Ques. 45. Where is the eighth pair joined by the nervous accessorius?

Ans. In its passage through the jugular foramen.

Ques. 46. What is the course of the nervous accessorius?

Ans. It ascends from the spinal marrow, enters the cranium at the foramen magnum occipitale, and joining the par vagum, passes out again to be distributed to the integuments and muscles at the back of the neck.

Ques. 47. How is the glosso-pharyngeal nerve distributed?

Ans. It is distributed to the tonsils, pharynx, and tongue, and sends branches of communication to the fifth, seventh, and ninth pairs.

Ques. 48. What is the situation of the par vagum in its passage from the head to the chest?

Ans. It passes before and adheres to the ninth pair,

and to the superior cervical ganglion of the great sympathetic; it descends along the neck by the side of the carotid artery, behind the internal jugular vein, and in company with the great sympathetic nerve.

Ques. 49. What are the first branches which the par vagum gives off?

Ans. It gives off, first, a branch to the glosso-pharyngeal; second, the pharyngeal to the pharynx; thirdly, the laryngeal to the larynx and thyroid gland; fourthly, branches to the cardiac plexus, and others of communication with the great sympathetic, the recurrent, and ninth pair.

Ques. 50. How does the par vagum enter the thorax?

Ans. It enters the thorax passing before the subclavian artery and vein on the right side; but on the left, behind the subclavian vein, and before the arch of the aorta; it then gives off the recurrent.

Ques. 51. What is the course and distribution of the recurrent nerve?

Ans. It forms a kind of loop, which embraces the subclavian artery on the right side and aorta on the left; it then runs behind these vessels ascending to the posterior part of the larynx to be distributed to its muscles, and communicate with the great sympathetic, the cardiac plexus, &c.

Ques. 52. What is the course and distribution of the rest of the par vagum?

Ans. They give branches which go to the heart, and form the cardiac plexus; branches to the lungs, forming the pulmonary plexuses; they then pass to the œsophagus, descend behind it to the stomach, forming the œsophageal plexus; and especially distributed to the stomach, forming the coronary plexus.

Ninth Pair.

Ques. 53. Where do the lingual nerves arise ?

Ans. They arise between the corpora pyramidalia and olivaria, by several filaments, which, uniting, form two small chords.

Ques. 54. How do they make their exit from the cranium ?

Ans. They pierce the dura mater, and pass out of the cranium by the anterior condyloid foramina.

Ques. 55. To what nerves do the ninth pair adhere on their exit from the cranium ?

Ans. After quitting the cranium each is united to the trunk of the eighth pair, to the superior cervical ganglion, and by a branch of communication to the tenth pair.

Ques. 56. What is their course and distribution ?

Ans. They pass before the large ganglion of the great sympathetic, run between the internal jugular vein and carotid artery, and then to the tongue, to the muscles of which they are distributed.

Ques 57. What branches do they give off in their passage toward the tongue ?

Ans. Shortly after their exit from the cranium they give off a large branch, which descends along with the carotid artery, called descendens noni.

Ques. 58. How is the descendens noni distributed ?

Ans. It joins branches from the first, second, and third cervical, and is distributed with them to the muscles at the fore part of the neck.

Tenth Pair.

Ques. 59. Where do the sub-occipital nerves arise ?

Ans. They arise at the extremity of the medulla ob-

longata and beginning of the spinal marrow, by small filaments.

Ques. 60. How do they make their exit from the cranium?

Ans. They pass directly outward, and having pierced the dura mater where the vertebral arteries enter, and running in its duplicature, emerge under the edge of the occipital foramen.

Ques. 61. What branches are given off by the sub-occipital pair?

Ans. They send branches of communication to the eighth and ninth pairs, to the superior cervical ganglion, and to the first cervical pair; and are then distributed to the extensor muscles of the head and occiput.

Respiratory Nerves.

Ques. 62. What are the respiratory nerves?

Ans. The par vagum, the portio dura of the face, the external thoracic, the phrenic, and the spinal accessory nerves.

Ques. 63. What would be the effect of dividing the portio dura?

Ans. It would stop the motions of the nostrils, lips, &c.

Ques. 64. What effects would follow the division of the recurrent branch of the par vagum?

Ans. The voice would be destroyed.

Ques. 65. Suppose the laryngeal branch of the par vagum were divided, what would be the consequence?

Ans. The consent of motion between the muscles of the glottis and the muscles of the chest would be lost.

Ques. 66. What effect is produced by injury or compression of the par vagum?

Ans. Difficulty of breathing would be the consequence.

Ques. 67. Suppose the phrenic nerve were divided, what would then take place?

Ans. It would stop the motion of the diaphragm ?

Ques. 68. What consequences would be produced by a division of the spinal accessory nerve ?

Ans. The respiratory motion of the mastoid and trapezius muscles would be destroyed.

SECTION LXIII.

OF THE VERTEBRAL NERVES IN GENERAL.

Ques. 1. In what manner do the vertebral nerves arise from the medulla spinalis ?

Ans. Each vertebral nerve arises from the medulla spinalis by two fasciculi of nervous filaments ; one anterior, the other posterior.

Ques. 2. How do they pass from the canal of the spine ?

Ans. The two fasciculi uniting, perforate the dura mater, and pass through the lateral foramina of the vertebral column.

Ques. 3. How are the two fasciculi of the vertebral nerves connected on their exit from the spine ?

Ans. They unite and form a ganglion, from which the trunk is produced, and from which immediately one branch passes backwards and one forwards.

Ques. 4. How many pairs are there of the vertebral nerves ?

Ans. There are thirty pairs, viz., seven cervical, twelve dorsal, five lumbar, and six sacral.

SECTION LXIV.

OF THE CERVICAL NERVES.

First Pair.

Ques. 1. How do the first pair of cervical nerves make their exit?

Ans. They pass out between the first and second cervical vertebræ.

Ques. 2. How is the anterior branch of the first pair of cervical nerves distributed?

Ans. It communicates with the superior cervical ganglion, and with the sub-occipital nerve it sends branches to join the descendens noni and the second cervical pair, and others to the muscles at the anterior part of the neck.

Ques. 3. How is the posterior branch distributed?

Ans. This is the most considerable branch; it is distributed to the muscles at the upper and back part of the neck.

Second Pair.

Ques. 4. Where do the second pair of cervical nerves make their exit?

Ans. They pass out between the second and third cervical vertebræ.

Ques. 5. How is the anterior branch of the second pair of cervical nerves distributed?

Ans. Its anterior branch communicates with the second and fourth cervical pairs, the great sympathetic, the de-

scendens noni ; and often concurs in the formation of the phrenic nerve.

Ques. 6. What is the distribution of the posterior branch of the second pair of cervical nerves ?

Ans. Its posterior branch follows a nearly similar course to that of the first pair, with which it anastomoses, as well as with the portio dura of the seventh.

Third Pair.

Ques. 7. Where do the third pair of cervical nerves pass out ?

Ans. Between the third and fourth cervical vertebræ.

Ques. 8. How is the anterior branch distributed ?

Ans. It communicates with the great sympathetic, fifth cervical, and sends a large branch to the phrenic.

Ques. 9. How is its posterior branch distributed ?

Ans. It is distributed to the back of the neck, and with those already noticed forms a plexus of nerves, which supply the back of the neck and head.

Diaphragmatic Nerve.

Ques. 10. How is the diaphragmatic or phrenic nerve formed ?

Ans. It is formed by branches from several of the cervical nerves ; of these the most constant and largest is from the third cervical.

Ques. 11. What is its course ?

Ans. It runs before the scalenus, enters the thorax behind the anterior extremity of the clavicle ; then receiving a filament from the first dorsal, and communicating with the sympathetic, it passes obliquely before the subclavian artery, and on one side of the par vagum, near the origin of the recurrent ; within the thorax it passes before the

root of the lung, along the side of the pericardium, then running backwards enters the diaphragm.

Ques. 12. In what does the course of the right diaphragmatic nerve differ from that of the left?

Ans. The right nerve runs straighter, and lies more anteriorly; the left lies backward towards the aorta, then bending over the pericardium, where it covers the apex of the heart; it is longer than the right.

Ques. 13. How is it distributed?

Ans. It terminates by numerous ramifications on the greater muscle of the diaphragm, and by some filaments on the lesser, where it communicates with the sympathetic, and contiguous abdominal plexuses.

Fourth, Fifth, Sixth, and Seventh Pairs.

Ques. 14. How do the last four pairs of cervical nerves pass to the neck?

Ans. The fourth, fifth, sixth, and seventh cervical pairs pass from the spine between their respective vertebræ.

Ques. 15. How are their posterior branches distributed?

Ans. Their posterior branches are small, and distributed to the posterior part of the neck, and upper part of the back.

Ques. 16. How are their anterior branches distributed?

Ans. Their anterior branches are considerable; they send small branches of communication to the great sympathetic, a few to the neighbouring muscles, glands, &c. &c.; they then unite, and, together with the first dorsal, form the axillary plexus.

SECTION LXV.

OF THE BRACHIAL NERVES.

Ques. 1. What is the axillary plexus ?

Ans. It is the union of the four inferior cervical and first dorsal nerves.

Ques. 2. How is the axillary plexus constructed ?

Ans. It consists at its origin of three distinct portions, viz., a, common trunk formed by the union of the fourth and fifth cervical ; below, a common trunk formed by the union of the last cervical and first dorsal ; and between these, the sixth cervical nerve alone : these soon unite and form a bundle of nerves so interwoven as not to be unravelled, which pass under the clavicle with the artery and vein into the axilla.

Ques. 3. Whence do the brachial nerves arise ?

Ans. From the axillary plexus.

Ques. 4. What are the different branches of the brachial nerves ?

Ans. The scapularis and the thoracic nerves are first given off ; they then divide into six large nerves, viz., the musculo-cutaneous, the median, the cubital, the internal cutaneous, the radial, and the axillary.

Ques. 5. From what part of the great plexus do the brachial nerves arise ?

Ans. The musculo-cutaneous, median, cubital, and internal cutaneous arise anteriorly ; the radial and axillary posteriorly.

Ques. 6. Where does the scapularis nerve arise ?

Ans. It arises from the upper and back part of the plexus.

Ques. 7. What is its course and distribution ?

Ans. It runs to the coracoid notch, passes over it, and is distributed to the supra and infra spinatus, and teres minor.

Ques. 8. Where do the thoracic nerves arise ?

Ans. They are three in number, and arise from the upper part of the plexus ?

Ques. 9. How are they distributed ?

Ans. They are distributed to the pectoralis major and minor, serratus major anticus, and latissimus dorsi.

Ques. 10. What is the course and distribution of the musculo-cutaneous nerve ?

Ans. It passes through the substance of the coraco brachialis, then between the biceps and brachialis ; to these it gives branches, and is distributed to the skin at the outer part of the fore arm and back of the hand.

Ques. 11. What is the course and distribution of the median nerve ?

Ans. It is the largest nerve from the axillary plexus ; it accompanies the brachial artery ; in the fore arm it passes deep-seated, between the flexor sublimis and profundus, under the ligamentum annulare carpi, to the palm of the hand, where it divides into branches, viz., two to the thumb, two to the fore finger, two to the middle finger, and one to the ring finger, after communicating with a branch of the cubital.

Ques. 12. What is the course and distribution of the cubital nerve ?

Ans. It descends along the inner part of the arm, passes in a groove between the inner condyle of the humerus and the olecranon, perforates the flexor carpi ulnaris, descends over the ligamentum annulare carpi to the palm of the hand, where it sends off one branch to the ring finger, two to the little finger, and a branch of communication to the median.

Ques. 13. What is the course and distribution of the internal cutaneous nerve ?

Ans. It is the smallest of the brachial nerves ; it passes superficially along the inside of the arm, and is distributed to the integuments at the inner and fore part of the fore arm.

Ques. 14. What is the course and distribution of the radial nerve ?

Ans. It runs backward round the os humeri, covered by the triceps, to which it gives branches to the outside of the elbow ; at the bend of the arm it descends between the brachialis and supinator longus, to which and to the contiguous extensors and supinators it gives rami ; it here divides into a superficial, and a profound branch ; the superficial branch accompanies the radial artery ; and at the lower part of the radius it sends rami to the convex part of the thumb and three adjacent fingers ; the profound branch passes between the upper extremity of the radius and supinator brevis, in its passage supplying the neighbouring muscles ; it is then lost in the extensor communis and muscles of the carpus and thumb, after having given a ramus to the musculo-cutaneous nerve.

Ques. 15. What is the course and distribution of the axillary nerve ?

Ans. It runs in the axilla, between the teres major and minor, and behind the head of the os humeri, round the neck of which it turns, passing between the articulation and the upper end of the long head of the triceps to the deltoid, under which it passes and ramifies, supplying the adjacent muscles and the joints.

SECTION LXVI.

OF THE DORSAL NERVES.

Ques. 1. Of how many pairs do the dorsal nerves consist?

Ans. There are twelve pairs of dorsal nerves.

Ques. 2. How do they pass from the vertebral canal?

Ans. They arise from the spinal marrow in the same way as the cervical, and like them pass out through the holes formed by the junction of the vertebral notches.

Ques. 3. How do they resemble each other?

Ans. Each presents a gangliform enlargement, from which a small posterior branch and a large anterior branch arise.

Ques. 4. How are the posterior branches distributed?

Ans. They are distributed to the muscles and integuments of the back.

Ques. 5. How are the anterior branches distributed?

Ans. They each send two branches to the thoracic ganglia of the great sympathetic; they then follow the course and distribution of the intercostal arteries, and are called the intercostal nerves.

Ques. 6. To the formation of what nerves do the first dorsal pair contribute?

Ans. After communicating with the great sympathetic and sending off its posterior and a small intercostal branch, it concurs in the formation of the axillary plexus.

Ques. 7. How are the humeral nerves formed?

Ans. The second and third intercostals send branches to form the humeral nerves, which pass into the axilla, and are distributed to the integuments on the inside of the upper arm.

Ques. 8. How are the lower five dorsal nerves distributed ?

Ans. They supply the muscles and integuments of the abdomen.

SECTION LXVII.

OF THE LUMBAR NERVES.

Ques. 1. Of how many pairs do the lumbar nerves consist ?

Ans. There are five pairs of lumbar nerves.

Ques. 2. What is their general course and distribution ?

Ans. They form each a ganglion after leaving the spine, and send off an anterior and a posterior branch in the same manner as the cervical and dorsal nerves ; they send branches backward to the vertebral muscles, and communicate with each other and with the sympathetic ; by their mutual communication they form the lumbar plexus.

First Pair.

Ques. 3. What is the course and distribution of the first lumbar pair ?

Ans. The first lumbar pair is distributed in three branches ; one to the abdominal muscles, around the crista of the ilium ; the other passes to the pubis and scrotum, and the third to the groin, where it contributes to form the crural nerve.

Second Pair.

Ques. 4. What is the course and distribution of the second pair ?

Ans. They contribute largely to the lumbar plexus, and concur in the formation of the crural and obturator nerves.

Third Pair.

Ques. 5. What is the distribution of the third pair ?

Ans. They contribute to form the crural and obturator nerves, and give branches to the neighbouring muscles.

Fourth Pair.

Ques. 6. What is the distribution of the fourth pair ?

Ans. The fourth pair sends a branch which, joining one from the third and one from the second pair, forms the obturator ; at the same place it completes the formation of the crural nerve : its remaining portion joins the fifth pair.

Fifth Pair.

Ques. 7. What is the course and distribution of the fifth pair ?

Ans. They descend on the sacro-iliac symphysis, enter the pelvis, and receiving a branch from the fourth lumbar, join the sacral nerves to produce the sciatic plexus.

Obturator Nerve.

Ques. 8. What is the origin of the obturator nerve ?

Ans. It is formed by branches from the second, third, and fourth pairs of lumbar nerves.

Ques. 9. What is its course and distribution ?

Ans. It passes from the pelvis at the upper part of the obturator foramen, supplying in its course the obturator muscles and pectineus ; it then divides into three chief branches to the portions of the triceps, and sends rami between them to the gracilis.

SECTION LXVIII.

OF THE SACRAL NERVES.

Ques. 1. Of how many pairs do the sacral nerves consist ?

Ans. There are generally six pairs of sacral nerves.

Ques. 2. How are they distributed ?

Ans. Their posterior small branches pass out by the posterior sacral foramina ; the anterior branches of the four superior pass through the anterior sacral foramina ; the two inferior through the lateral notches at the extremity of that bone, and in the os coccygis.

Ques. 3. What relation do they bear to each other in size ?

Ans. The first pair is very large ; the inferior ones gradually diminish ; the last is very small.

Ques. 4. Which of them form the sciatic plexus ?

Ans. The three superior, by their junction with the fourth and fifth lumbar pairs.

Ques. 5. What are the branches proceeding from the sciatic plexus ?

Ans. From the plexus, but more especially from the second pair, a branch goes to the vesiculæ seminales, prostate gland, uterus, and fallopian tubes ; another, chiefly from the fourth pair, has a similar distribution, and goes also to the rectum and bladder ; a third branch, the pudic, chiefly from the third, runs on the inside of the ischium to the corpus cavernosum, the muscles, parts of generation, and sphincter ani ; from the extremity of the plexus, one branch, the glutæal, goes to the glutæus medius and minimus.

Ques. 6. How are the two last pairs of sacral nerves distributed ?

Ans. The fifth pair, running forward between the extremity of the sacrum and ligament of the os coccygis, is distributed chiefly to the muscles of the anus, and neighbouring integuments ; the last pair, running in a direct line from the extremity of the sacral canal, is distributed to the anus, integuments, &c.

SECTION LXIX.

OF THE CRURAL AND SCIATIC NERVES.

Crural Nerve.

Ques. 1. How is the crural nerve formed ?

Ans. It is formed by the union of the three or four superior lumbar nerves.

Ques. 2. How does it pass out of the abdomen ?

Ans. Under Poupart's ligament to the groin.

Ques. 3. How is it situated with regard to the femoral artery and vein ?

Ans. It is situated anteriorly to these vessels ?

Ques. 4. What is its course and distribution ?

Ans. In the groin it divides into numerous branches ; some superficial, which go to the integuments ; others profound, which are distributed to the neighbouring muscles ; one branch, longer and larger than the rest, accompanies the saphena vein to the ankle ; and in its course on the thigh, accompanies the femoral artery.

Sciatic Nerve.

Ques. 8. How is the great sciatic nerve formed ?

Ans. It is the largest nerve in the human body, and is formed by the plexiform union of the last lumbar and first four sacral pairs.

Ques. 6. How does it pass out of the pelvis, and what is its course ?

Ans. It passes out by the great ischiatic notch, proceeds betwixt the great trochanter and tuberosity of the ischium, descends on the back part of the thigh to the ham, where it receives the name of popliteal nerve.

Ques. 7. What branches does it give off ?

Ans. It gives branches to the muscles and integuments in its passage to the ham.

Ques. 8. What is the situation, course, and distribution of the popliteal nerve ?

Ans. It is situated between the hamstrings, and divides into an external or fibular nerve, and an internal or tibial nerve, which gradually separate and pass behind the condyles of the os femoris, and between the heads of the gastrocnemii muscles.

Ques. 9. What is the course of the tibial nerve ?

Ans. It descends behind the popliteal muscle by the side of the plantaris, between the gastrocnemii; it then pierces the head of the soleus, and runs between that muscle and the great flexors of the toes, near to the inner ankle.

Ques. 10. What is its distribution?

Ans. It sends rami to the joint of the knee, the muscles, and integuments contiguous to its course; it sends also a greater branch from its upper part, which gives one filament to the tibialis posticus, and another perforating the interosseous ligament to the upper part of the tibialis anticus muscle; it then sends a long ramus down the back of the leg, between the integuments and gastrocnemius, by the side of the saphena externa; the trunk then passes behind the inner ankle through an angular ligament to the sole of the foot, where it divides into the external and internal plantar nerves, which accompany the arteries of the same name.

Ques. 11. What is the course and distribution of the internal plantar nerve?

Ans. It runs first along the inner side of the sole of the foot, giving filaments to the adductor pollicis, flexor brevis digitorum, and massa carnea sylvii; it then divides into four branches, which are distributed to the toes after the manner of the median nerve in the hand.

Ques. 12. What is the course and distribution of the external plantar nerve?

Ans. It passes along the outer edge of the foot and divides into two branches; the first branch runs between the two last toes, and divides to their sides; the second branch goes to the inferior external side of the little toe.

Ques. 13. What is the course and distribution of the fibular nerve?

Ans. It runs forward round the head of the fibula, and divides into several rami, which are distributed to the outer part of the leg and to the upper part of the foot, where it is distributed to the integuments.

SECTION LXX.

OF THE GREAT SYMPATHETIC NERVE.

Ques. 1. What is the general situation of the great sympathetic nerve ?

Ans. It is placed on the anterior and lateral parts of the spine, before the roots of the transverse processes ; extending from the foramen carotideum of the temporal bone, to the lower part of the sacrum.

Ques. 2. What is its origin ?

Ans. It is considered generally as beginning from a branch of the sixth pair given off in the cavernous sinus, and which is soon joined by another from the Vidian nerve.

Ques. 3. What is the general arrangement of the great sympathetic nerve ?

Ans. It has, at different distances, a great number of gangliform tubercles, from which ramifications proceed forward, as well as filaments backward, to the ganglia of the nerves of the medulla spinalis.

Ques. 4. How are the ganglia of the sympathetic divided ?

Ans. They are divided into cervical, dorsal, lumbar, and sacral.

Ques. 5. How many cervical ganglia are there ?

Ans. There are three cervical ganglia, viz., a superior, a middle, and an inferior.

Ques. 6. What is the form and situation of the first or superior cervical ganglion ?

Ans. It is large, soft, and of an oblong figure ; situated longitudinally before the roots of the transverse processes of the first three vertebræ, and behind the internal carotid.

Ques. 7. What branches join the superior cervical ganglion ?

Ans. It is closely connected with the eighth and ninth pairs, and receives other filaments from them, as well as from the four superior cervical nerves ; it sends branches to the pharynx ; others, which surround the blood vessels, and a branch to the heart, called the superior or superficial cardiac nerve.

Ques. 8. What are the communications which the descending trunk of the great sympathetic forms in the neck ?

Ans. In its course down the neck to the last cervical vertebra it communicates with the fifth and sixth cervical, and the recurrent, and sends branches to the cardiac plexus.

Ques. 9. What are the branches given off by the middle cervical ganglion ?

Ans. This ganglion is not constant ; when present, it gives and receives the branches noticed as belonging to its trunk in the neck.

Ques. 10. Where is the inferior cervical ganglion situated ?

Ans. It is situated behind the vertebral artery, at the root of the transverse process of the last cervical vertebra.

Ques. 11. What branches does it give and receive ?

Ans. It receives branches from the three inferior cervical and first dorsal pair, and from the recurrent ; and sends off branches to the cardiac and pulmonary plexuses.

Ques. 12. Where does the great sympathetic form the first dorsal ganglion ?

Ans. Immediately below the inferior cervical and behind the subclavian artery.

Ques. 13. How are the inferior cervical and first dorsal ganglia connected ?

Ans. They are connected to each other by a short portion of the trunk, which is sometimes double and plex-

iform, and by a branch which passes before the subclavian artery ; thus forming an arch which encloses the artery.

Ques. 14. How is the cardiac plexus formed ?

Ans. It consists of branches from the trunk of the great sympathetic in the neck, (or from the middle cervical ganglion, when present,) and from the inferior cervical ganglion ; and meeting those from the other side, they form the cardiac plexus, whose branches supply the heart and its pericardium.

Ques. 15. What is the course of the great sympathetic trunk as it descends in the thorax ?

Ans. From the first dorsal ganglion the great sympathetic descends over the ligaments, joining the heads of the ribs to the vertebræ ; on the last false rib it bends towards the bodies of the vertebræ ; between each rib it forms a ganglion ; these ganglia regularly communicate with the dorsal nerves by two filaments from each.

Ques. 16. What branches does the great sympathetic give off about the middle of the thorax ?

Ans. It gives off five, and sometimes more ; considerable branches from several ganglia below the fifth, pass forward and downward on the bodies of the vertebræ ; they unite and form one short nerve on the last dorsal vertebra, called the splanchnic.

Ques. 17. Where does the splanchnic nerve perforate the diaphragm ?

Ans. At the upper and lateral part of the lower muscle of the diaphragm.

Ques. 18. Where does the great sympathetic nerve form the semilunar ganglion ?

Ans. After having entered the abdomen, behind the renal capsule.

Ques. 19. What are the connexions and branches of the semilunar ganglion ?

Ans. It forms a communication between the splanchnic nerve of each side, before the aorta ; it then forms the

solar plexus, from whence proceed numerous branches to the different viscera, viz. ; the cœliac or stomachic plexus, to the stomach ; the hepatic plexus, to the liver, duodenum, and pancreas ; the splenic plexus, to the spleen and pancreas ; the renal or emulgent plexus, to the kidneys ; the superior mesenteric plexus, to the small intestines ; the inferior mesenteric plexus, to the large intestines ; the hypogastric plexus, to the contents of the pelvis ; the spermatic plexus, to the testicles.

Ques. 20. How is the trunk of the great sympathetic disposed of after having detached the five branches which form the splanchnic nerve ?

Ans. After forming the splanchnic, it perforates the inferior muscle of the diaphragm, and then runs on the bodies of the vertebræ, where it forms the lumbar ganglia.

Ques. 21. What filaments do the lumbar ganglia receive from the lumbar nerves ?

Ans. Each lumbar ganglion receives two filaments from the corresponding lumbar nerve.

Ques. 22. With what nerves do the sacral ganglia communicate ?

Ans. The great sympathetic passes into the pelvis, communicating with the sacral nerves, where it forms the sacral ganglia.

Ques. 23. How does the great sympathetic nerve terminate ?

Ans. It sends branches to the inferior mesenteric plexus, and terminates by a communication with the nerve of the opposite side, forming an inverted arch, where, together with the two lowest sacral nerves, it gives several branches to the rectum, anus, and coccygeal muscles.

SECTION LXXI.

PECULIARITIES OF THE FEMALE.

Ques. 1. What is remarkable in the integuments of the female?

Ans. They are softer than in the male, and on the face there is no beard.

Ques. 2. What is the situation of the mammæ?

Ans. They are two glandular bodies, of a hemispherical figure, situated at the anterior and superior part of the thorax, on the pectoralis major, and covered by the skin.

Ques. 3. What is their size?

Ans. Their size is various in different subjects, but they acquire their chief bulk at the age of puberty.

Ques. 4. Of what parts do the mammæ consist?

Ans. Each mammæ consists of the papillæ or nipple, the areola, and the glandular substance of the mammæ.

Ques. 5. What are the papillæ, or nipples?

Ans. They are of a red colour, projecting from the anterior and middle part of the breast, and are capable of erection.

Ques. 6. What is their structure?

Ans. They consist of common integuments, and of a firm elastic substance, in which are placed from fifteen to twenty ducts, called tubuli lactiferi; these are the excretory ducts of the gland, and terminate on the surface of the nipple by open mouths.

Ques. 7. What is the structure of the areola?

Ans. The areola is a circular disk at the base of the

nipple, and of a similar red colour ; it contains numerous sebaceous follicles.

Ques. 8. What is the structure of the body of the mammæ ?

Ans. The glandular substance of the mammæ is imbedded in a quantity of fat, which forms the great bulk of the breast ; it consists of numerous separate, white, glandular portions, from which the lactiferous tubes arise and approach the nipple, into which they run and terminate.

Ques. 9. What is the use of the mammæ ?

Ans. They secrete the milk for the purpose of nourishing the offspring ; they are therefore hardly developed before the age of puberty, and shrink in old age.

[NOTE. The bones of the female have some peculiarities, and the leading anatomical properties are the organs of generation, which have both been already noticed under their proper heads.]

SECTION LXXII.

PECULIARITIES OF THE FŒTUS.

Ques. 1. What is peculiar to the bones of the fœtus ?

Ans. They are imperfectly formed ; many of them consist of cartilage, while others are much more advanced ; of this last kind are the ossicular auditus, the clavicles, ribs, and the vertebræ.

Ques. 2. What is noticed in the adipose substance of the fœtus ?

Ans. It is not found about the internal parts as in the adult, but is chiefly placed under the skin.

Ques. 3. What is remarkable in the brain and nerves of the fœtus ?

Ans. They bear a larger proportion to the rest of the body.

Ques. 4. What is peculiar in the eye of the fœtus ?

Ans. A remarkable membrane blocks up the pupil, being attached to the loose edge of the iris, called *membrana pupillaris* ; it disappears sometime before birth.

Ques. 5. What is peculiar in the glandular system of the fœtus ?

Ans. The thymus gland is very large, and gradually disappears after birth ; the liver is much larger, and so are the renal glands ; and the kidneys are of a more lobulated form.

Ques. 6. How is the testicles situated in the fœtus ?

Ans. In the early months they are situated in the cavity of the abdomen, a little below the kidneys ; they gradually descend towards the abdominal ring, and pass into the scrotum ?

Ques. 7. What are the parts peculiar to the fœtal circulation ?

Ans. They are the foramen ovale of the heart, the *canalis arteriosus*, the *canalis venosus*, the *funis* or umbilical cord, the umbilical vein, and two umbilical arteries.

Ques. 8. Describe the foramen ovale.

Ans. It is an oval opening in the *septum auricularum*, by which the blood passes from the right to the left auricle ; a valve prevents its return in the contrary direction. In the adult this foramen is almost completely obliterated, though its situation may always be perceived.

Ques. 9. Describe the *canalis arteriosus*.

Ans. It connects the pulmonary artery to the ascending

aorta, and transmits the blood, which cannot pass through the lungs, from the right ventricle into the aorta.

Ques. 10. Describe the *canalis venosus*.

Ans. It is little more than half an inch in length, and passes from the termination of the umbilical vein in the liver to the inferior vena cava.

Ques. 11. What is the course of the umbilical vein?

Ans. It passes from the umbilicus to the liver.

Ques. 12. What is the course of the umbilical arteries?

Ans. They arise from the internal iliac arteries, and pass up the sides of the bladder to the umbilicus.

Ques. 13. How is the umbilical cord formed?

Ans. It consists of three vessels, viz., the umbilical vein, and the two umbilical arteries, which, on quitting the abdomen of the fœtus at the navel, unite and form this long cord of communication with the mother.

Ques. 14. Describe the course of the fœtal circulation.

Ans. It is thus performed: the blood is conveyed to the fœtus through the umbilical vein, from which the greater part passes through the liver, and the rest by the ductus venosus into the vena cava, and thus to the right auricle; from this auricle it partly passes into the right ventricle, but partly also through the foramen ovale into the left auricle; the portion which passes into the right ventricle is transmitted through the pulmonary artery to the lungs in part, but chiefly through the *canalis arteriosus* into the aorta; the blood which the pulmonary veins bring into the left auricle passes with that received through the foramen ovale into the left ventricle, whence it is transmitted through the whole system, and returned by the veins: to the mother the blood is returned by the umbilical arteries.

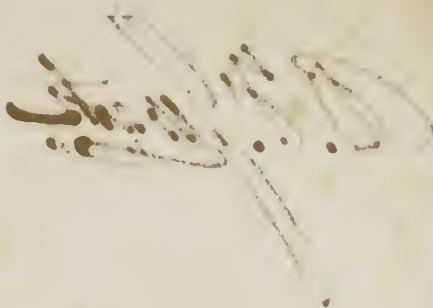
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